KINGSWAY

MATHEMATICS

BLUE BOOK 2

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BASIC TRAINING SCHOOL * HOOGHLY

THE KINGSWAY

MATHEMATICS

BLUE BOOK 2

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BASIC TRAINING SCHOOL HOOGHLY

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ACKNOWLEDGEMENTS

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WHAT YOU HAVE LEARNED

In Book 1, you learned:

1. How to add, subtract, multiply and divide:
   (*a*) Simple numbers; (*b*) Money;
   (*c*) Weights and measures; (*d*) Vulgar fractions.
2. How to find the area of a rectangle.
3. How to find the volume of a box.
4. How to write out a bill.
5. How to measure and draw angles.
6. How to read and make a chart.

Now try the tests on pages 10–11 to see if you have remembered this.

```
 £  s.   d.
 1  16   7 × 18
        18
---------------
32  18   6
===============
14  10 126
18 108 ---
-- 
32 180
-- ---
   298
   ---
```

```
     £   s.   d.
     1   2    9
    ------------
17)19    6    9
   17   40  144
   --   --  ---
    2   46  153
    -   34  153
        --  ---
        12
        --  ---
```

£5 3s. 6d. = 103s. 6d. = 207 sixpences.

247 threepences = 61s. 9d. = £3 1s. 9d.

$$\frac{\text{£2 5s. 6d.}}{\text{3s. 6d.}} = \frac{\text{45s. 6d.}}{\text{3s. 6d.}} = \frac{\text{91 sixpences}}{\text{7 sixpences}} = 13$$

If the answer to a sum is £5 17s. $4\frac{3}{4}$d., it can be given in any one of the following ways :
(a) £5 17s. 5d. (correct to the nearest penny)
(b) £5 17s. 6d. (correct to the nearest sixpence)
(c) £5 17s. (correct to the nearest shilling)
(d) £6 (correct to the nearest pound)

The value of a fraction is not altered by multiplying, or dividing, the numerator and denominator by the same number.

$\frac{5}{6}=\frac{15}{18}$ **(Multiplying the numerator and denominator by 3)**

$\frac{12}{24}=\frac{1}{2}$ **(Dividing the numerator by and denominator by 12)**

$$2\frac{1}{2}-3\frac{2}{3}+3\frac{3}{4}=2\frac{6-8+9}{12}=2\frac{7}{12}$$

$$\frac{3}{4}\times2\frac{1}{2}=\frac{3}{4}\times\frac{5}{2}=\frac{15}{8}=1\frac{7}{8}$$

$$\frac{2}{3}\div2\frac{1}{2}=\frac{2}{3}\times\frac{2}{5}=\frac{4}{15}$$

Find the value of: $35\times24\div56$

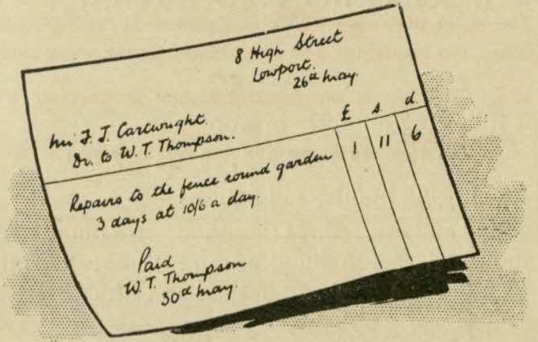
$$35\times24\div56=\frac{\overset{5}{\cancel{35}}\times\overset{3}{\cancel{24}}}{\underset{\underset{1}{\cancel{8}}}{\cancel{56}}}=15$$

Area of rectangle
$=l\times b$
or $A=lb$

Volume of box
$=l\times b\times h$
or $V=lbh$

Perimeter of rectangle
$=2(l+b)$
or $P=2(l+b)$

$ab=a\times b$ $abc=a\times b\times c$ $2a=2\times a$



8 High Street
Lowport.
26th May

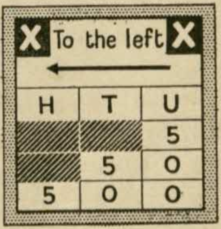
Mr. J. J. Cartwright Dr. to W. T. Thompson.	£	s	d
Repairs to the fence round garden 3 days at 10/6 a day	1	11	6

Paid
W. T. Thompson
30th May

To **MULTIPLY BY 10** move the figures one place to the left.

To **MULTIPLY BY 100**, move the figures two places to the left.

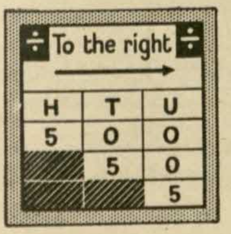
Noughts are used to show which columns are empty.



× To the left ×

←

H	T	U
▨	▨	5
▨	5	0
5	0	0



÷ To the right ÷

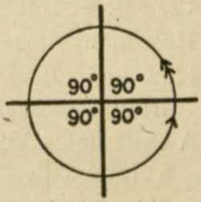
→

H	T	U
5	0	0
▨	5	0
▨	▨	5

To **DIVIDE BY 10**, move the figures one place to the right.

To **DIVIDE BY 100**, move the figures two places to the right.

A CIRCLE	contains 360 degrees
A RIGHT-ANGLE	contains 90 degrees
AN OBTUSE ANGLE	is greater than a right-angle
AN ACUTE ANGLE	is smaller than a right-angle



I. REVISION EXERCISES

Test A

1. (*a*) Write the following numbers in words:

   301; 1,009; 2,375; 3,048; 2,209.

   (*b*) Write the following numbers in figures:

   Six hundred and fifty; three thousand; five hundred and sixty-nine; four thousand, seven hundred and three; two thousand, two hundred and twenty; five thousand and fifty.

2. 4,635 + 7,043 + 2,209 + 3,468 + 77
3. 5,205 − 2,797
4. 385 × 76
5. 8,113 ÷ 59

Test B

1. £36 12*s*. 7½*d*. + £16 9*s*. 10¾*d*. + £9 18*s*. 6½*d*. + £11 13*s*. 9½*d*.
2. £42 6*s*. 5½*d*. − £17 17*s*. 7¾*d*.
3. 14*s*. 2½*d*. × (*a*) 9, (*b*) 22, (*c*) 34.
4. £200 13*s*. 4*d*. ÷ (*a*) 7, (*b*) 32, (*c*) 43.
5. How many times is 8*s*. 6*d*. contained in £11 9*s*. 6*d*.?

Test C

1. 2 lb. 4 oz. + 3 lb. 10 oz. + 1 lb. 12 oz. + 5 lb. 13 oz.
2. 12 st. 6½ lb. − 5 st. 11 lb.
3. 3 qr. 8 lb. × (*a*) 5, (*b*) 14, (*c*) 19. Give your answers in cwt. qr. lb. Add your answers to (*a*) and (*b*) and compare the result with your answer to (*c*).
4. 111 tons 3 qr. ÷ (*a*) 9, (*b*) 21, (*c*) 47.
5. How many times is 12 lb. contained in 6 cwt. 24 lb.?

Test D

1. 3 qt. 1 pt. × (*a*) 12, (*b*) 28, (*c*) 52. Give your answer in gal. qt.
2. 195 gal. ÷ (*a*) 8, (*b*) 15, (*c*) 26. Give your answer in gal. qt. pt.
3. How many times can 1 gal. 2 qt. be taken from a 51-gal. tank?
4. How many times can a jug which holds a pint and a quarter be filled from a bucket holding 3 gal. 1 pt.?
5. A crate holds 30 bottles of milk. The milkman supplies a school with 8 crates daily. If a bottle holds ⅓ of a pint, how many gallons of milk are supplied to the school in 5 days?

Test E

1. 1 ml. 5 fur. 1 chn. + 3 ml. 6 fur. 8 chn. + 5 ml. 5 fur. 5 chn.
2. 27 chn. 10 yd. − 18 chn. 16 yd.
3. (i) 2 ft. 6 in. × (*a*) 10, (*b*) 24, (*c*) 34. Give your answer in yd. and ft.
   (ii) Add the answers of (*a*) and (*b*) and compare the result with (*c*).
4. 77 yd. 1 ft. 6 in. ÷ (*a*) 5, (*b*) 18, (*c*) 31.
5. How many times is 2 ft. 10 in. contained in 102 ft.?

> LEARN
>
> **The value of a vulgar fraction is not changed by multiplying or dividing the numerator and denominator by the same number.**

Test F

1. (*a*) Fill the blank spaces with numbers which keep the fractions equal:

$$\frac{3}{4} = \frac{21}{\quad} = \frac{\quad}{12} = \frac{\quad}{20} = \frac{12}{\quad} = \frac{\quad}{36}.$$

   (*b*) Write the following fractions in their lowest terms:

$$\frac{9}{15},\quad \frac{10}{12},\quad \frac{28}{35},\quad \frac{21}{24},\quad \frac{16}{36}.$$

   (*c*) Arrange these fractions in order, placing the smallest first:

$$\frac{5}{8},\quad \frac{11}{12},\quad \frac{3}{4},\quad \frac{5}{6}.$$

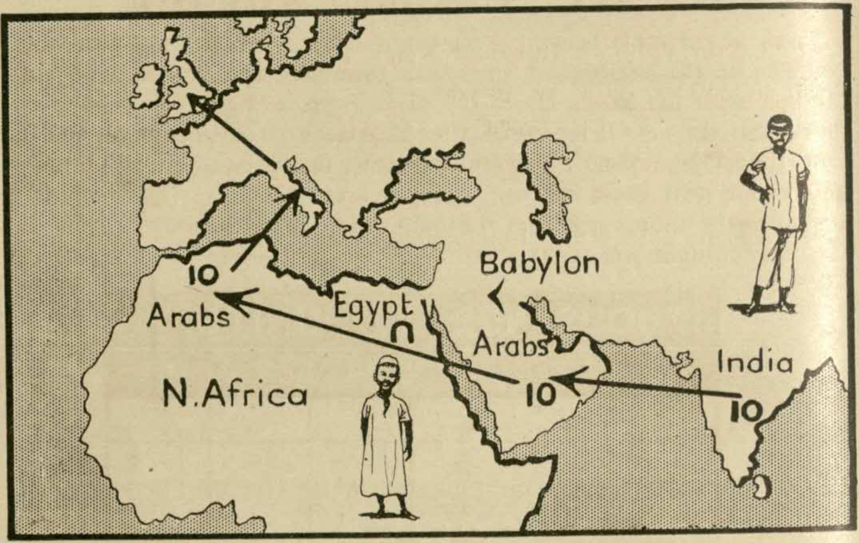
2. (*a*) Write these five improper fractions as mixed numbers:

$$\frac{11}{3},\quad \frac{15}{4},\quad \frac{21}{10},\quad \frac{9}{2},\quad \frac{17}{6}.$$

   (*b*) Write these mixed numbers as improper fractions:

$$3\tfrac{2}{5},\quad 4\tfrac{5}{9},\quad 1\tfrac{3}{8},\quad 3\tfrac{1}{7},\quad 2\tfrac{5}{12}.$$

3. (*a*) $5\tfrac{2}{3} + 2\tfrac{3}{8}$ (*b*) $2\tfrac{4}{5} + 1\tfrac{3}{4}$ (*c*) $2\tfrac{5}{6} - 1\tfrac{3}{4}$
   (*d*) $9\tfrac{1}{2} - 5\tfrac{7}{9}$ (*e*) $\tfrac{2}{3} \times \tfrac{3}{4}$ (*f*) $\tfrac{3}{10} \div 1\tfrac{1}{5}$
   (*g*) $\tfrac{4}{5} \times \tfrac{3}{4}$ (*h*) $1\tfrac{1}{3} \times \tfrac{3}{8}$ (*i*) $\tfrac{7}{16} \div 1\tfrac{3}{4}$
4. Re-write each of the following quantities as stated:
   (*a*) £13 12*s*. 9½*d*. to the nearest shilling.
   (*b*) £2 13*s*. 8¾*d*. to the nearest sixpence.
   (*c*) £503 16*s*. 6*d*. to the nearest pound (£).
   (*d*) 13 cwt. 2 qr. 17 lb. to the nearest hundredweight.
   (*e*) 7 ml. 3 fur. 2 chn. to the nearest furlong.
   (*f*) 5,628 to the nearest ten.
   (*g*) 5,628 to the nearest hundred.
   (*h*) 5,628 to the nearest thousand.
5. A cardboard box is 10 in. long, 8 in. wide, and 5 in. deep. Find:
   (*a*) the area of the bottom ; (*b*) the volume of the box.



II. WRITING NUMBERS

SOMETHING TO READ : THE TRAVELS OF NUMBER TEN (10)

About 700 years ago, a young man called LEONARDO returned home to Italy and showed his friends a new way to write numbers. Instead of II (two), he wrote z (2) ; instead of III (three), he wrote ƺ (3).

Leonardo was the son of an Italian merchant who had lived in North Africa for many years. He was taught these new figures by the ARABS, who had seen them being used by the HINDUS in India.

At first there were only nine figures, 1, 2, 3, 4, 5, 6, 7, 8, 9, and numbers were written in ruled columns. The column on the right was used for **units**, the next column for **tens**, and the third column for **hundreds**. The Hindus then noticed that, if the figures were written very carefully, the ruled columns, could be omitted. Careless people, however, often read the numbers wrongly and, to prevent mistakes, **all the empty spaces were filled by noughts** (0). The numbers can now be written as 052, 502, and 520, and there is no doubt to which column each figure belongs. The first number is usually written as 52, but 052 is not really wrong.

H	T	U
	5	2
5		2
5	2	

	5	2
5		2
5	2	

0	5	2
5	0	2
5	2	0

	5	2
5	0	2
5	2	0

EXERCISE 1. MORE ABOUT PLACE VALUE

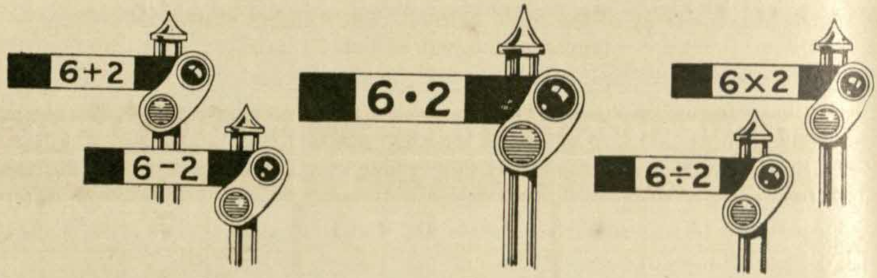
Look at the table below. You will see that there are now three extra columns on the left beneath the words **thousands,** and that these are also marked with the letters H, T, U. The 2 on the right now represents 2 **thousands**; the next 2 represent 2 **ten thousands,** or 20 **thousands**; and the 2 on the left represents 2 **hundred thousands**; that is, we have two hundred and twenty-two thousands or, using figures, 222,000. The comma (,) separates the thousands from the units, and the three noughts show that the other columns are empty.

THOUSANDS			UNITS		
H	T	U	H	T	U
2	2	2			
		5			
	3	1			
6		7			

1. (*a*) How many thousands are there in the second number in the table?
   (*b*) Write this number in words and in figures.
   (*c*) Write each of the other numbers in this table in words and in figures.
2. Draw a copy of the table below. In the table show: one hundred; one hundred thousand; three thousand; fifty.
   Now write the whole number in words and figures.

THOUSANDS			UNITS		
H	T	U	H	T	U

3. Write the following numbers in words: 306; 360; 3,000; 33,000; 30,030; 4,578.
4. Write the following numbers in figures: four hundred; four thousand; four thousand, four hundred; fifty-three; fifty-three thousand and fifty-three; one hundred and one thousand, two hundred and two.
5. What is (*a*) the largest, and (*b*) the smallest number you can make with the figures 5, 9, 8, 6?
6. What is the greatest number of three figures?
7. (*a*) What is the smallest number of four figures that begins with 2 and ends with 3? You may take nought (0) as a figure.
   (*b*) What is the greatest number of four figures that begins with 2 and ends with 3?



EXERCISE 2. A SPECIAL SIGN—THE DECIMAL POINT

Examine the number *one hundred and eleven* (111), and be prepared to answer the following questions:

(*a*) What is the value of each figure 1?

(*b*) Does the value of this figure increase or decrease as it is moved towards the *right*?

(*c*) Find the values of the following:

(i) $\frac{1}{10}$ of 100; (ii) $\frac{1}{10}$ of 10; (iii) $\frac{1}{10}$ of $\frac{1}{10}$.

In the table below, the number 111 is written in columns, and there are other columns to the left and right. Be ready to answer the following questions:

(*a*) What is the value of the figure 1 in the line below the number 111?

(*b*) How many times is this greater than 100?

(*c*) What do you think will be the value of the figure 1 in the third line? Will it be greater or smaller than 1 unit?

(*d*) What will be the value of the figure 1 in the fourth line?

(*e*) What is the value of each figure in the last line?

ANDS		UNITS					
T	U	H	T	U			
		1	1	1			
	1						
					1		
						1	
	5	8	4	2	3	6	

The figures in the columns to the right of the units' column are DECIMAL FRACTIONS.

The figure in the FIRST COLUMN to the right of the units' column represents TENTHS; the figure in the next column represents tenths of tenths; that is, HUNDREDTHS.

1. (*a*) Make a copy of the table below. The number shown is:

$$1{,}000 + 700 + 60 + 3 + \tfrac{2}{10} + \tfrac{7}{100}.$$

THOUSANDS			UNITS			DECIMAL FRACTIONS			
H	T	U	H	T	U				
		1	7	6	3	2	7		

(*b*) Write the following numbers in the columns of this table. Take a separate line for each number.

$$500 + 20 + 9 + \tfrac{6}{10} + \tfrac{8}{100}$$
$$3{,}574 + \tfrac{7}{10} + \tfrac{2}{100}$$
$$4{,}563 + \tfrac{6}{10} + \tfrac{7}{100}$$

Look up the meaning of the word "decimal" in the dictionary, and try to explain why these fractions are called decimal fractions. When writing fractions, we can omit the columns if we make some sign to show where the units (or whole numbers) end and where the fractions begin. The special sign used is a dot placed ABOVE the line; it is known as the DECIMAL POINT.

The first number in the table of Question 1 is written as 1,763·27 and is read as ONE THOUSAND, SEVEN HUNDRED AND SIXTY-THREE DECIMAL TWO, SEVEN.

You must note that this number should NOT be read as: ONE THOUSAND, SEVEN HUNDRED AND SIXTY-THREE DECIMAL TWENTY-SEVEN.

The ·27 is two tenths and seven hundredths, NOT twenty-seven units.

2. (*a*) Write the last three numbers of the table in Question 1 without using ruled columns.

(*b*) Write these three numbers in words.

3. Write down the value of each figure in the following:

(*a*) 56·37 (*b*) 307·77 (*c*) 2,005·08 (*d*) 760·01

4. Write the following numbers in figures:

(*a*) Three hundred and eight, four tenths, and six hundredths.

(*b*) Two thousand and twenty-two, and two hundredths.
(*There are no tenths in this number.*)

(*c*) Thirty-three decimal five, two.

(*d*) Five thousand, nine hundred and nine decimal two, four.

5. Draw lines of the following lengths:

1·2 in.; 2·3 in.; 2·7 in.; 3·1 in.; 3·9 in.

EXERCISE 3. ADDITION AND SUBTRACTION

1. (*a*) How many tenths are there in a whole one?
   (*b*) Write the following improper fractions as mixed numbers:
   $\frac{17}{10}$; $\frac{23}{10}$; $\frac{29}{10}$; $\frac{33}{10}$; $\frac{31}{10}$; $\frac{57}{10}$; $\frac{79}{10}$.
   (*c*) What is the value of: $\frac{7}{10} + \frac{4}{10} + \frac{3}{10} + \frac{5}{10} + \frac{8}{10}$?
   (*d*) What is the value of: 0·7 + 0·4 + 0·3 + 0·5 + 0·8?

2. (*a*) Look at the addition sum at the side. How many tenths are there in the tenths' column?
   (*b*) How many whole ones (units) will this make?
   (*c*) Copy the sum into your book and complete the addition of the five numbers.

6·4
3·3
8·7
5·2
1·9

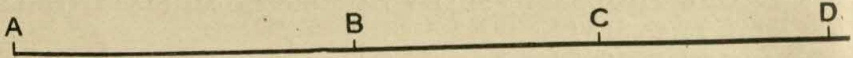
3. (*a*) Look at the next sum. How many hundredths are there in the hundredths' column? How many tenths will this make?
   (*b*) Copy the sum into your book and complete the addition.

8·56
5·02
2·88

4. Find the total of each of the following:

(*a*)	(*b*)	(*c*)	(*d*)
9·8	4·36	66·08	123·7
7·5	21·09	10·05	68·08
9·47	35·86	5·67	100·36
3·9		25·25	55·5
6·7		16·61	77·02

5. (*a*) What is the value of 1·8 + 1·3 + 1·2?
   (*b*) Draw any straight line:



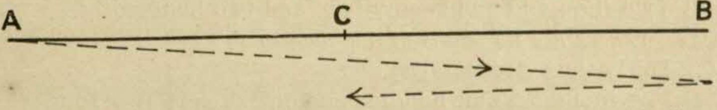
From A, measure AB (1·8 in.); from B, measure BC (1·3 in.); from C, measure CD (1·2 in.).

Measure the length of AD.

Does your result agree with the answer of (*a*) above?

6. (*a*) What is the value of 2·3 + 1·6 + 0·8?
   (*b*) Test your answer by drawing, as in the last question.

7. (*a*) What is the value of 3·7 − 1·9?
   (*b*) Draw a line AB, 3·7 in. long. From B, measure BC (1·9 in.) to the left.



Find the length of AC. Does the result agree with the answer obtained in (*a*)?

8. (*a*) What is the value of 5·1 − 3·6?

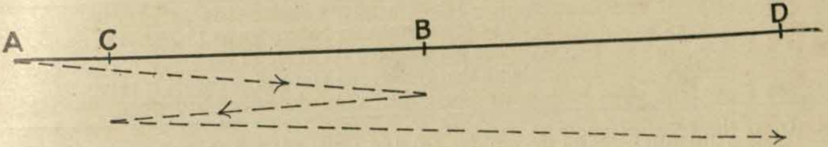
(*b*) Test your answer by drawing as in the last question.

9. Find the answers to the following subtraction sums:

(*a*) 54·67	(*b*) 7·6	(*c*) 2·93	(*d*) 137·03	(*e*) 100·2
39·53	2·8	1·37	99·27	67·38

10. (*a*) What is the value of 2·2 − 1·7 + 3·6?

(*b*) Draw any straight line. From A, measure AB (2·2 in.) to the right; from B, measure BC (1·7 in.) to the left; from C, measure CD (3·6 in.) to the right.



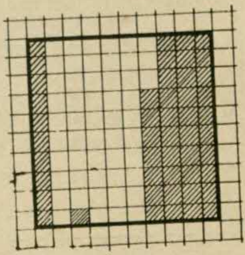
Measure the length of AD. Does your result agree with your answer to (*a*)?

11. (*a*) What is the value of 3·2 + 1·9 − 2·7?

(*b*) Test your answer by drawing.

12. Find the next two numbers in each of the following:

(*a*) 0·3, 0·6, 0·9, 1·2, etc.
(*b*) 0·3, 0·5, 0·7, 0·9, etc.
(*c*) 1·6, 2·4, 3·2, 4, etc.
(*d*) 7·1, 6·8, 6·5, 6·2, etc.
(*e*) 9·8, 9·2, 8·6, 8, etc.



13. (*a*) On squared paper, draw an inch square and shade a tenth of the square, as shown on the left-hand side of the figure.

(*b*) Now shade a tenth of a tenth; that is, a hundredth of the square.

(*c*) On the right-hand side of this square, three-tenths and seven hundredths are shaded; that is, 0·37 of the square is shaded. Draw three other inch squares and shade (i) 0·25, (ii) 0·5, and (iii) 0·75 of these squares.

LEARN
½ = 0·5; ¼ = 0·25; ¾ = 0·75

EXERCISE 4. DIVISION OF DECIMALS

1. Draw a line 3·6 in. in length. Find the mid-point of this line and measure the length of each half. What is the value of 3·6 ÷ 2?

2. (*a*) How many tenths are there in 1·4?
   (*b*) What is a half of 1·4? Write your answer as a decimal.
   (*c*) What is a half of 7·4? (*d*) What is a third of 7·2?
   (*e*) How many hundredths are there in 0·16?
   (*f*) What is a half of 0·16? Write your answer as a decimal.

3. (*a*) What is the value of 5·2 ÷ 4? Test your answer by a drawing.
   (*b*) What is the value of 6·5 ÷ 5? Test your answer by a drawing.

$$13{\cdot}2 \div 8 = \frac{13{\cdot}20}{8} = 1{\cdot}65$$

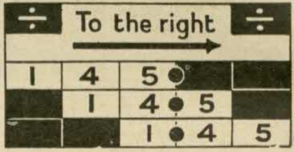
The numerator may be written as 13·20. The nought (0) has not changed the value of the number; it merely shows that the second place of decimals is empty.

4. Write your answers as decimals: (*a*) 456÷10; (*b*) 1,379÷10; (*c*) 65·7÷10.

LEARN

TO DIVIDE BY 10,
move the figures one place to the right.

TO DIVIDE BY 100,
move the figures two places to the right.



$$60{\cdot}3 \div 28 = \frac{60{\cdot}3}{28} = \frac{15{\cdot}07+}{7} = 2{\cdot}15+ \quad \text{or} \quad 60{\cdot}3 \div 28 = \frac{60{\cdot}3}{28} = 2{\cdot}15+$$

Both the numerator and denominator of the fraction, $\frac{60{\cdot}3}{28}$, have been divided by 4.

The plus sign (+) after the figures 7 and 5 shows that the division can be carried further.

$$\begin{array}{r} 2{\cdot}15 \\ 28\overline{)60{\cdot}3} \\ 56 \\ \hline 43 \\ 28 \\ \hline 150 \\ 140 \\ \hline 10 \end{array}$$

5. Find the answers of the following sums:

(*a*) 21 ÷ 7	(*b*) 35 ÷ 5	(*c*) 24 ÷ 6	(*d*) 32 ÷ 8
(*e*) 2·1 ÷ 7	(*f*) 3·5 ÷ 5	(*g*) 2·4 ÷ 6	(*h*) 3·2 ÷ 8
(*i*) 43·6 ÷ 2	(*j*) 43·6 ÷ 20	(*k*) 17·4 ÷ 3	(*l*) 17·4 ÷ 30

6. Find the values of the following. Do not work to more than two decimal places: (*a*) 56·7 ÷ 6; (*b*) 29·4 ÷ 8; (*c*) 78·9 ÷ 24; (*d*) 83·2 ÷ 35.

III. AVERAGES

EXERCISE 5. GENERAL EXERCISES

1. (*a*) The table below gives the attendances made by a class during a certain week. What is the total number of these attendances?

Monday		**Tuesday**		**Wednesday**		**Thursday**		**Friday**	
a.m.	**p.m.**	**a.m.**	**p.m.**	**a.m.**	**p.m.**	**a.m.**	**p.m.**	**a.m.**	**p.m.**
26	**27**	**29**	**27**	**21**	**26**	**30**	**30**	**29**	**25**

(*b*) On which day was the attendance highest?

(*c*) On which half-day was the attendance lowest?

(*d*) What is the value of 270 ÷ 10?

From your last answer, you will easily see that if 27 children had attended on each half day, the total number of attendances for the week would still have been 270.

27 is called the **average** attendance for this week.

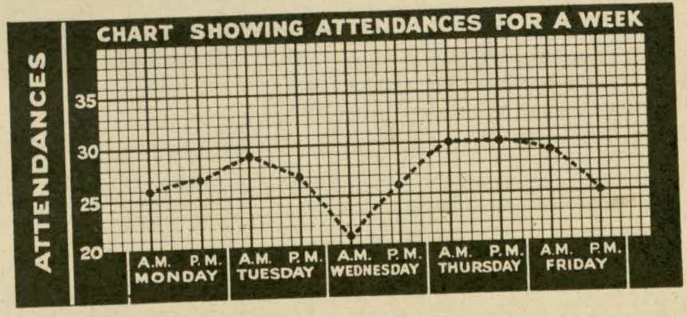
2. (*a*) Look at the chart below. What is shown by this chart ?

(*Compare it with the table in Question* 1.)

(*b*) Why does the dotted line rise and fall?

(*c*) Why is the dotted line joining the points for Thursday morning and afternoon level?

(*d*) Make a copy of this chart on squared paper. Then, draw a line to show what the chart would have been like if the attendances for each half-day had been 27.



(*e*) On which half-days is the attendance *above the average*?

(*f*) On which half-days is the attendance *below the average*?

3. (*a*) What is the total of the following numbers:
342, 356, 361, 349, 365, 355, 352, 344?
(*b*) How many numbers have been added together?
(*c*) What is the average of these numbers?

4. Find the average attendance of a class for a week from the following attendances: 25, 26, 28, 28, 28, 27, 29, 29, 26, 24.

5. (*a*) Find the total of the following amounts:
12*s*. 7*d*., 9*s*. 3*d*., 15*s*. 8*d*., 10*s*. 5*d*., 11*s*. 9*d*.
(*b*) What is the average of these amounts? Give your answer to the nearest penny.

6. Find the average of the following:
(*a*) 156, 212, 415, 309, and 279. Give your answer to one decimal place.
(*b*) £3 10*s*. 6*d* ; £5 3*s*. 9*d*.; £3 19*s*. 8d.; £6 16*s*. 3*d*. Give your answer correct to the nearest sixpence.
(*c*) 2 yd. 2 ft. 7 in.; 3 yd. 1 ft. 9 in.; 2 yd. 0 ft. 5 in. Give your answer correct to the nearest inch.
(*d*) 3½, 2¾, 5½, 4¼, 3¾, 1½, 2¼, 2½.
(*e*) 13·8, 10·06, 12·05, 11·7, 11·09, and 10·3. Give your answer to one decimal place.

7. Find the average daily rainfall for a week when the readings of the rain-gauge were: Monday, 0·03 in.; Tuesday, 0·05 in.; Wednesday, nil; Thursday, 0·12 in.; Friday, nil; Saturday, 0·07 in.; and Sunday, 0·02 in. Give your answer to two places of decimals.

8. During a holiday I walked a distance of 15 miles on the first day, 19 miles on the second day, and 23, 17, 25, 12, 10, and 26 miles on the following days.
(*a*) What was the total distance walked during this time?
(*b*) Find the average distance walked each day. Give the answer to one decimal place.

9. A teacher bought the following books for the library: 15 books at 1*s*. 3*d*. each; 18 books at 1*s*. 6*d*.; 25 at 2*s*. 6*d*.; and 6 books at 5*s*. each.
(*a*) What was the total cost of these books?
(*b*) What was the total number of books bought?
(*c*) What was the average cost of these books to the nearest penny?

10. The following table gives the times of the morning trains from Birmingham to Wolverhampton. Find: (*a*) the time taken by each train; and (*b*) the average time taken by these trains.

Birmingham .. ..dep.	**7.45**	**8.33**	**8.45**	**9.26**	**10.40**	**11.35**	**12.00**
Wolverhampton .. ..arr.	**8.22**	**8.53**	**9.20**	**9.53**	**11.15**	**12.10**	**12.35**

11. (*a*) At the end of the week, a grocer finds that his average daily takings amount to £3 15*s.* 7*d.* What was the total amount of his takings for this week of six days?

(*b*) If his takings on the Saturday amounted to £6 11*s.*, what was the amount taken on the first five days of this week?

(*c*) What were his average takings for these five days?

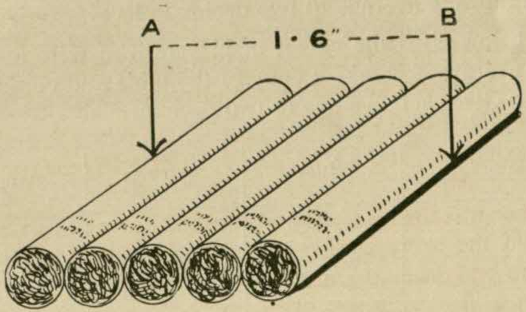
12. The average weight of four men was found to be 12 st. 3 lb. Three of these men weighed 10 st. 10 lb., 13 st. 8 lb., and 11 st. 6 lb. respectively. What was the weight of the fourth man?

13. (*a*) A sheet of ruled paper contains 23 lines. How many spaces are there between the lines?

(*b*) If the distance between the top line and the bottom line is 7⅓ in., what is the average distance between two lines?

(*c*) Measure the distance from the top line to the bottom line of a sheet of your exercise book, and find the average distance between two of the lines.

14. (*a*) When five cigarettes were placed side by side, as shown in the sketch, the distance from A to B was found to be 1·6 in. What was the average thickness of these cigarettes?



(*b*) When five cigarettes were placed in a line the total length was 14·5 in. What was the average length of these cigarettes?

15. (*a*) A shorthand typist took down a message of 855 words in 9 minutes. What is the average speed for shorthand in words per minute?

(*b*) If the typist then typed this message in 19 minutes, what is her average speed for typing in words per minute?

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EXERCISE 6. CRICKET AVERAGES

1. During the cricket season, Andrews took 11 wickets for a total of 74 runs. Find his bowling average to two decimal places.

2. The table below gives the names of players who were at the top of the bowling averages. Make a copy of the table and complete the fourth column. Give each average to two decimal places.

Bowler	Runs	Wickets	Average
Andrews ..	74	11	
Brown	550	42	
Jones	3,032	211	
Green	1,017	67	
Smith	1,977	129	
Bailey	2,981	193	
Thomas ..	1,174	71	
Evans	2,610	157	

3. During the cricket season Richards made 2,616 runs in 58 innings but was " not out " on 5 occasions.
   (*a*) How many times was Richards " out " in the season?
   (*b*) What was his batting average for each time " out "?

4. (*a*) Jones made 2,494 runs in 54 innings, but was " not out " in 3 innings. How many times was he " out " during the season?

(*b*) What was his average number of runs for completed innings?

5. The table below gives the names of players who were at the top of the batting averages. Make a copy of the table and complete the fifth column.

Batsmen	Innings	Runs	Not out	Average
Richards ..	58	2,616	5	
Jones ..	54	2,494	3	
Green ..	15	654	1	
Smith ..	10	369	2	
Carter ..	47	1,724	9	
Evans ..	55	2,019	9	
Walker ..	50	1,867	7	
Harvey ..	49	1,530	13	
Kingston ..	55	2,147	4	
Parker ..	51	1,925	5	

6. From the particulars given in the table below, find the batting and bowling averages of the players. Then arrange in order (*a*) the batsmen and (*b*) the bowlers.

Player	Batting			Bowling	
	Inn.	Not Out	Runs	Runs	Wickets
Brown	16	3	267	406	19
Jones	10	—	153	258	42
Johnson	19	2	530	398	16
Thompson	12	1	252	427	31
Adams	17	—	166	302	49
Hawkins	15	1	408	414	14
Smith	7	2	192	228	7
Harris...........	20	1	316	372	13

EXERCISE 7. GOAL AVERAGE

1. (*a*) The table below shows the three leading schools at the end of the football season. Find the number of points gained by each school, allowing two points for a win and one point for a draw.

School	P.	W.	D.	L.	Goals	
					For	Agst.
Saltwells Road ..	10	3	6	1	22	7
Park Lane	10	6	—	4	18	10
Grove Street ..	10	5	2	3	14	6

(*b*) When football teams receive the same number of points, their positions in the table are decided on **Goal Average.** This goal average is found by dividing the number of goals scored **for** the team by the number of goals scored **against** the team. Thus we have goal average for Saltwells Road $= \frac{\text{Goals For}}{\text{Goals Against}} = \frac{22}{7} = 3{\cdot}14 +$

Find the goal average of (i) Park Lane and (ii) Grove Street.

(*c*) Arrange the above school teams in their correct order.

2. From the particulars given in the tables below, (i) find the number of points gained by each team; (ii) find the goal average of the teams which have gained the same number of points; and (iii) write the names of the schools in their correct order.

FOOTBALL LEAGUE *(BOYS)*

Name of School	P	W	D	L	GOALS	
					FOR	AGST.
Townhead Avenue	10	5	3	2	19	5
Duke Street	10	7	1	2	22	8
New Road	10	2	5	3	10	8
South Street	10	4	1	5	13	12
Station Road	10	4	5	1	16	10
Church Road	10	6	3	1	25	12

NETBALL LEAGUE *(GIRLS)*

Name of School	P	W	D	L	GOALS	
					FOR	AGST.
Townhead Avenue	10	5	-	5	34	16
Duke Street	10	3	6	1	36	17
New Road	10	7	2	1	31	15
South Street	10	5	2	3	40	13
Station Road	10	1	8	1	30	15
Church Road	10	4	3	3	28	17

HOCKEY LEAGUE *(GIRLS)*

Name of School	P	W	D	L	GOALS	
					FOR	AGST.
Townhead Avenue	10	7	1	2	17	5
Duke Street	10	5	3	2	15	16
New Road	10	2	8	-	22	15
South Street	10	6	-	4	12	8
Station Road	10	1	3	6	10	6
Church Road	10	3	7	-	13	18

IV. DECIMAL AND VULGAR FRACTIONS

EXERCISE 8. CHANGING THE FORM OF A FRACTION

1. Fill in the missing numerators in the following fractions:

(*a*) $\frac{10}{100} = \frac{}{10}$ (*b*) $\frac{20}{100} = \frac{}{10}$ (*c*) $\frac{70}{100} = \frac{}{10}$ (*d*) $\frac{90}{100} = \frac{}{10}$

(*e*) $\frac{3}{10} = \frac{}{100}$ (*f*) $\frac{6}{10} = \frac{}{100}$ (*g*) $\frac{4}{10} = \frac{}{100}$ (*h*) $\frac{8}{10} = \frac{}{100}$

$$\frac{62}{100} = \frac{60}{100} + \frac{2}{100} = \frac{6}{10} + \frac{2}{100} = 0{\cdot}62 \text{ or } {\cdot}62$$

2. Write the following vulgar fractions as decimal fractions:

(*a*) $\frac{3}{10}$ (*b*) $\frac{5}{10}$ (*c*) $\frac{2}{10}$ (*d*) $\frac{7}{10}$ (*e*) $\frac{9}{10}$

(*f*) $\frac{1}{100}$ (*g*) $\frac{7}{100}$ (*h*) $\frac{5}{100}$ (*i*) $\frac{8}{100}$ (*j*) $\frac{9}{100}$

(*k*) $\frac{30}{100}$ (*l*) $\frac{32}{100}$ (*m*) $\frac{70}{100}$ (*n*) $\frac{73}{100}$ (*o*) $\frac{58}{100}$

$$0{\cdot}32 = \frac{3}{10} + \frac{2}{100} = \frac{30}{100} + \frac{2}{100} = \frac{32}{100} = \frac{8}{25}$$

You will be able to omit many of these fractions, and work as in the next example.

$$0{\cdot}35 = \frac{35}{100} = \frac{7}{20}$$

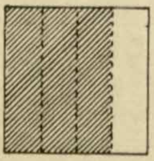
3. Write the following as vulgar fractions in their lowest terms:

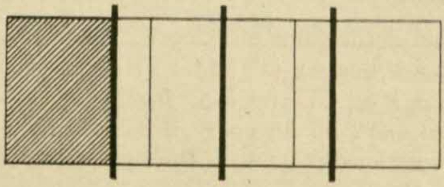
(*a*) 0·7 (*b*) 0·5 (*c*) 0·25 (*d*) 0·75 (*e*) 0·36

(*f*) 0·28 (*g*) 0·55 (*h*) 0·65 (*i*) 0·52 (*j*) 0·88

4. Look at the diagrams below. On the left, three-quarters ($\frac{3}{4}$) of the square has been shaded. On the right, three (3) squares have been divided into four (4) equal parts and one part is shaded. The shaded portions show that three-quarters ($\frac{3}{4}$) is equal to three (3) divided by four (4).

$$\tfrac{3}{4} = 3 \div 4 \quad \text{or} \quad 3 \div 4 = \tfrac{3}{4}$$





Draw a line 3 inches long and divide it into four equal parts. Is $3 \div 4 = \frac{3}{4}$?

5. Change the following vulgar fractions into decimal fractions:

(*a*) $\frac{1}{8}$ (Divide 1 by 8); (*b*) $\frac{3}{8}$; (*c*) $\frac{5}{8}$; (*d*) $\frac{7}{8}$; (*e*) $\frac{1}{5}$; (*f*) $\frac{2}{5}$; (*g*) $\frac{3}{5}$; (*h*) $\frac{4}{5}$.

EXERCISE 9. DIVISION BY A DECIMAL

$$15{\cdot}3 \div 0{\cdot}2 = \frac{15{\cdot}3}{0{\cdot}2} = \frac{15{\cdot}3 \times 10}{0{\cdot}2 \times 10} = \frac{153}{2} = 76{\cdot}5$$

To make the divisor a whole number, 0·2 is multiplied by 10. Having multiplied the denominator by 10, we must do the same to the numerator.

1. Find the values of the following. Do not work to more than two places of decimals:

(*a*) 12·34 ÷ 2
(*b*) 12·34 ÷ 0·2
(*c*) 17·3 ÷ 0·3
(*d*) 42·36 ÷ 0·4
(*e*) 56·73 ÷ 0·5
(*f*) 35·5 ÷ 0·6
(*g*) 7·54 ÷ 1·6
(*h*) 74·13 ÷ 5·6
(*i*) 9·68 ÷ 3·2

Before working Question 2, find the approximate answers. For example:

56·7 ÷ 17 is roughly 60 ÷ 20; and the approximate answer is 3.

2. Find the values of the following:

(*a*) 56·7 ÷ 17
(*b*) 547·8 ÷ 19
(*c*) 70·05 ÷ 2·3
(*d*) 37·8 ÷ 3·1
(*e*) 876·4 ÷ 8·3
(*f*) 100·1 ÷ 4·7

LEARN

The answer of a division sum is called the QUOTIENT.

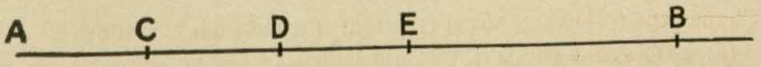
3. (*a*) 23·4 ÷ 0·8 = 29·25. Write down the quotient when 23·4 is divided by 8.

(*b*) 56·81 ÷ 23 = 2·47. Write down the quotient when 56·81 is divided by 2·3.

(*c*) 38·4 ÷ 1·6 = 24. Write down the quotient when 3·84 is divided by 16.

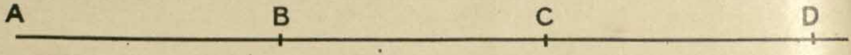
4. (*a*) What is the value of 3·5 ÷ 0·7?

(*b*) Draw a line AB (3·5 in.). From A, mark off AC (0·7 in.); from C, mark off CD (0·7 in.); from D, mark off DE (0·7 in.). Continue to mark off distances of 0·7 in., and find how many times 0·7 in. is contained in 3·5 in. Does your result agree with the answer found in (*a*)?



EXERCISE 10. MULTIPLICATION OF DECIMALS

1. (*a*) Draw a line of any length. Measure AB (1·4 in.); BC (1·4 in.); CD (1·4 in.). What is the length of AD?



(*b*) What is the value of 1·4 × 3?

(*c*) What is the value of 1·3 × 4? Test your answer by a drawing.

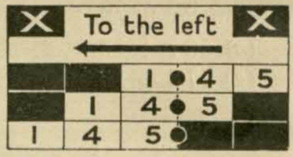
2. Write down the answers to the following:

(*a*) 0·3 × 2, 5, 9
(*b*) 0·29 × 4, 6, 7
(*c*) 0·6 × 10, 100
(*d*) 3·6 × 10, 100
(*e*) 0·72 × 10, 100
(*f*) 3·05 × 10, 100

LEARN

TO MULTIPLY BY 10,
move the figures one place to the left.

TO MULTIPLY BY 100,
move the figures two places to the left.



3. (*a*) What is the value of 6·37 × 10?

(*b*) From your last answer, find the value of 6·37 × 20.

(*c*) What is the value of 6·37 × 100?

(*d*) From your last answer, find the value of 6·37 × 200.

4. Find the values of the following:

(*a*) 1·37 × 10, 20, 70
(*b*) 16·08 × 10, 30, 90
(*c*) 7·26 × 100, 200, 600
(*d*) 10·54 × 100, 300, 700

5. Multiply 6·74 by (*a*) 7, (*b*) 10, (*c*) 30, and (*d*) find the value of 6·74 × 37 by adding the answers of (*a*) and (*c*).

The last sum is written as follows:

6·74 × 37
37

202·2 = 6·74 × 30
47·18 = 6·74 × 7

249·38 = 6·74 × 37

6. Copy the following and fill in the missing figures:

(*a*) 5·67 × 58
58
____ = 5·67 × 50
____ = 5·67 × 8
____ = 5·67 × 58

(*b*) 8·03 × 76
76
____
____
____

7. Find the value of each of the following, and check by division:
(*a*) 35·08 × 26 (*b*) 15·67 × 35 (*c*) 28·76 × 83
(*d*) 42·07 × 56 (*e*) 6·7 × 87 (*f*) 16·32 × 45

8. (*a*) What is the value of a tenth of 12·3?
(*b*) From your last answer find the value of two-tenths of 12·3.
(*c*) What is the value of 0·3 of 12·3?

9. Find the value of:
(*a*) 0·4 of 26·6 (*b*) 0·7 of 9·8 (*c*) 0·9 of 39·3
(*d*) 0·3 of 16·2 (*e*) 0·5 of 7·3 (*f*) 0·8 of 75·6

10. (*a*) Find the value of: 37·6 × 7 and 0·3 of 37·6.
(*b*) Add your two answers together to find the value of: 37·6 × 7·3.

Find the value of: 52·3 × 5·7

52·3 × 5·7
5·7
261·5 = 52·3 × 5
36·61 = 52·3 × 0·7
298·11 = 52·3 × 5·7

or

52·3 × 5·7
5·7
261·5
36·61
298·11

11. Find the value of:
(*a*) 7·6 × 6·3 (*b*) 3·2 × 7·2 (*c*) 52·3 × 2·8
(*d*) 35·8 × 4·7 (*e*) 46·1 × 5·8 (*f*) 29·9 × 2·9

12. 5·6 × 5·2 is equal to 29·12. From this answer write down the value of:
(*a*) 5·6 × 52 (*b*) 56 × 5·2

13. Work the sum 47 × 17, and from your answer find the value of:
(*a*) 4·7 × 17 (*b*) 4·7 × 1·7

14. Find the product of 263 and 37, and from your answer find the product of: (*a*) 26·3 and 370 ; (*b*) 26·3 and 3·7 ; (*c*) 2·63 and 370 ; (*d*) 2·63 and 3·7 ; (*e*) 26·3 and 0·37.

EXERCISE 11. MEASUREMENT OF AREA

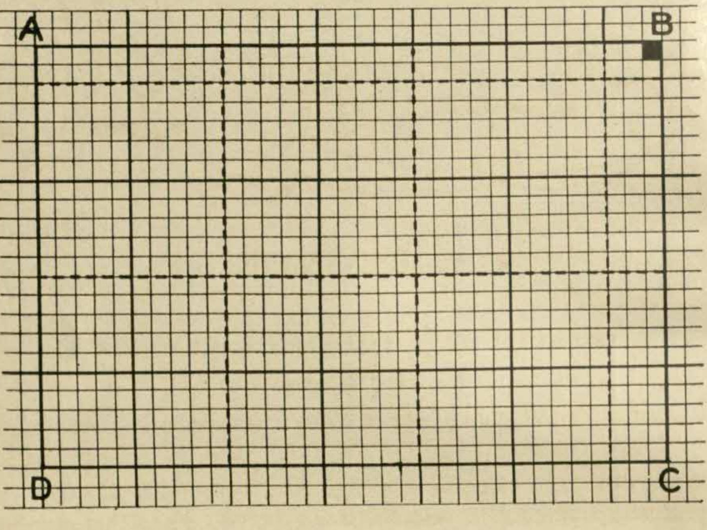
1. Look at the rectangle ABCD drawn on the squared paper below.

(*a*) What is the length and breadth of the rectangle?

(*b*) How many *complete* inch squares are there in this rectangle?

(*c*) What is the size of the small shaded square in the top right-hand corner?

(*d*) How many of these small squares would be required to make a tenth of a square inch?



(*e*) How many small squares are there in the rectangle ABCD, *outside* the complete inch-squares?

(*f*) What is the area of the rectangle ABCD in square-inches and decimals of a square-inch?

(*g*) What is the value of 3·3 × 2·2?

2. (*a*) Find the value of 4·6 × 3·1.

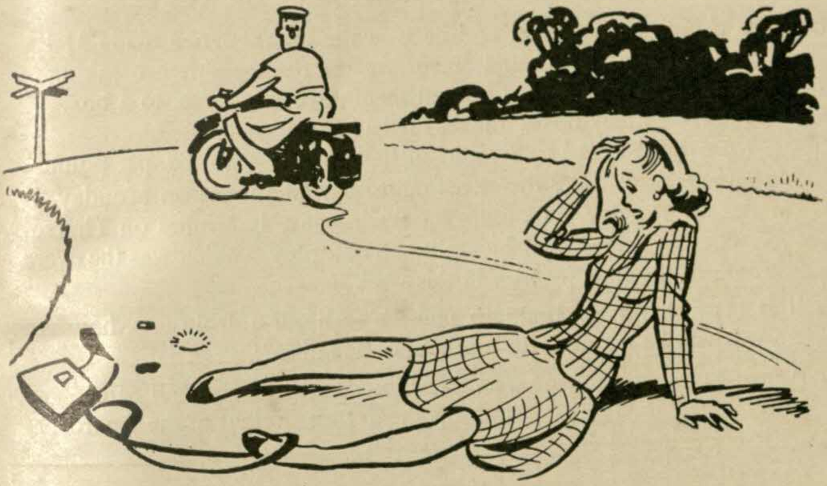
(*b*) What is the area of a rectangle 4·6 in. long and 3·1 in. wide?

(*c*) Draw this rectangle on squared paper and show your answer to be correct by counting the squares. Your work should be stated as below:

Number of complete inch squares = ...; Area = ... sq. in.
Number of small squares = ...; Area = ... sq. in.
Area of the rectangle = ... sq. in.

3. (*a*) What is the area of a rectangle 3·7 in. long and 2·6 in. wide?

(*b*) Show your answer to be correct by a drawing.



V. REVISION

EXERCISE 12. LOOKING BACKWARDS

First Glance

1. On a sheet of $\frac{1}{10}$ in. squared paper, draw a square having each of its sides 1 in. long. Shade (i) 0·01, (ii) 0·1, and (iii) 0·34 of the square.

2. (*a*) Write down the value of each figure in the number 273·03.
(*b*) Find the difference in value between the two 3's in this number.

3. (*a*) What is the value of $1·1 + 0·7 + 2·5$?
(*b*) What is the value of $3·2 - 1·9$?
(*c*) Check your results by drawing lines of suitable length.

4. Write down the value of each of the following:
(*a*) 2·2 × 10, 100, 5, 25.
(*b*) 3·6 × 10, 20, 70, 100, 300, 800.
(*c*) 67·2 ÷ 10, 20, 60.

Second Glance

1. Multiply 23·7 by (*a*) 38, (*b*) 7·2.

2. Write the following decimal fractions as vulgar fractions: 0·8; 0·26 ; 4·04.

3. Divide 502·6 by (*a*) 16, (*b*) 3·6, (*c*) 1·9.

4. Multiply 3·2 by 2·3, and show your result to be correct by drawing a rectangle 3·2 in. by 2·3 in. on $\frac{1}{10}$ in. squared paper.

Third Glance

1. For a church bazaar Joan and Betty made toffee. Joan made 3¾ lb. of butterscotch and Betty 4½ lb. of treacle toffee. After breaking and mixing these sweets, they packed them into boxes ¾ lb. to a box.
   (*a*) How many boxes did they need?
   (*b*) What was the total value of their sweets at 1*s*. 8*d*. per pound?
2. A commercial traveller drove his motor-car 48·3 miles on Monday, 74·8 miles on Tuesday, 53·6 miles on Wednesday, 16·8 miles on Thursday, 58 miles on Friday, and 26·3 miles on Saturday. What was the average length of his daily journey in this week?
3. If it takes 1¾ yd. of braid to make a sash for a drill tunic, how many yards will be required for a school of 288 girls?
4. A man has 3 parcels, each weighing 2 lb. 5 oz., and another 4 parcels, each weighing 2 lb. 8½ oz. What was the average weight of the 7 parcels?

LEARN

A figure of four sides with all its angles right-angles is called a RECTANGLE.

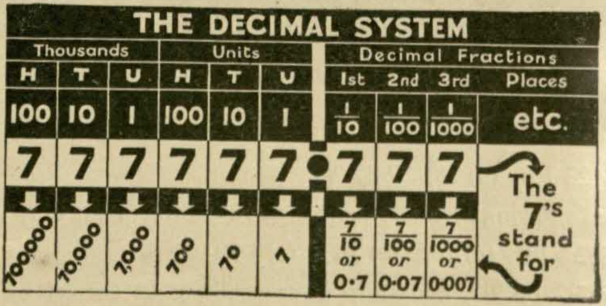
A rectangle having its four sides equal is called a SQUARE.

The total distance round any figure is called its PERIMETER.

A SQUARE-INCH is an area equal to the area of an inch square.

A CUBIC-INCH is a volume equal to the volume of an inch cube.

Area of Rectangle. $A = lb.$
Perimeter of a Rectangle. $P = 2(l + b)$
Volume of Box. $V = lbh.$



THE DECIMAL SYSTEM

Thousands			Units				Decimal Fractions			
H	T	U	H	T	U		1st	2nd	3rd	Places
100	10	1	100	10	1		$\frac{1}{10}$	$\frac{1}{100}$	$\frac{1}{1000}$	etc.
7	7	7	7	7	7	•	7	7	7	The 7's stand for
⬇	⬇	⬇	⬇	⬇	⬇		⬇	⬇	⬇	
700000	70000	7000	700	70	7		$\frac{7}{10}$ or 0·7	$\frac{7}{100}$ or 0·07	$\frac{7}{1000}$ or 0·007	

EXERCISE 13. MECHANICAL SUMS

Set A. Addition

1.	76,598
	25,387
	9,837
	15,982
	38,726

	£	*s.*	*d.*
2.	17	11	$10\frac{1}{2}$
	9	15	$6\frac{3}{4}$
	23	10	$8\frac{1}{2}$
	6	16	$7\frac{1}{2}$

	tons	cwt.	qr.
3.	6	17	2
	1	13	3
	2	9	3
	11	11	2

	ft.	in.
4.	7	$10\frac{1}{2}$
	5	$9\frac{1}{4}$
	2	$10\frac{3}{4}$
	3	$6\frac{1}{2}$

5.	43·68
	17·07
	10·03
	8·7
	36·28

6. $\frac{2}{3} + \frac{11}{12} + \frac{5}{8}$

7. $2\frac{3}{5} + 3\frac{3}{4}$

8. $5\frac{2}{9} + 1\frac{5}{6} + 2\frac{1}{2}$

Set B. Subtraction

1. 37,655 − 19,667
2. £15 12*s.* 5*d.* − £9 15*s.* $8\frac{1}{2}$*d.*
3. 3 lb. $8\frac{1}{2}$ oz. − 1 lb. $10\frac{3}{4}$ oz.
4. 7 ml. 1 fur. 3 chn. − 3 ml. 5 fur. 1 chn.
5. 300·3 − 30·03
6. $6\frac{2}{3} - 3\frac{1}{5}$
7. $7\frac{3}{4} - 2\frac{5}{6}$
8. 210·2 − 97·72

Set C. Multiplication

1. 4,063 × 23
2. £5 13*s.* $7\frac{3}{4}$*d.* × 24
3. 7 yd. 1 ft. 10 in. × 12
4. 7 cwt. 33 lb. × 8
5. 57·2 × 37·8
6. $3\frac{3}{8} \times 2\frac{2}{9}$

Set D. Division

1. 53,736 ÷ 9
2. 87,098 ÷ 34
3. £12 18*s.* 4*d.* ÷ 8
4. £269 6*s.* ÷ 48
5. £173 7*s.* 6*d.* ÷ 57
6. 19 tons 5 cwt. 1 qr. ÷ 23
7. $2\frac{2}{5} \div 2\frac{2}{3}$
8. $10\frac{5}{6} \div \frac{1}{4}$
9. 205·2 ÷ 8
10. 65·31 ÷ 0·7
11. 11·808 ÷ 4·8
12. 54·34 ÷ 2·6

Set E. Reduction

1. Change £6 17*s.* 3*d.* to threepences.
2. Change 509 in. to yards, feet, and inches.
3. Change 3 cwt. 2 qr. 26 lb. to pounds.
4. Change 117 pt. to gallons, quarts, and pints.

5. Change 5 ml. 5 fur. 2 chn. to chains.
6. Change 671 fourpences to pounds, shillings, and pence.
7. Change 1,156 qr. to tons and hundredweights.
8. How many times is 7*s.* 2*d.* contained in £2 10*s.* 2*d.*?
9. How many times is £1 5*s.* 4*d.* contained in £15 4*s.*?
10. How many times is 3 lb. 3 oz. contained in 25½ lb.?

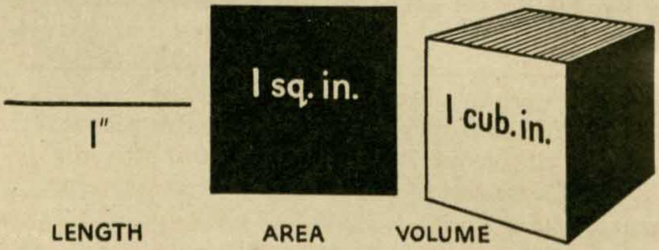
Set F. Averages

Find the average of:

1. 67, 69, 73, 65, 71, 66, 72.
2. 6·02, 5·93, 5·87, 6·42.
3. 2¾, 2, 3½, 3¼.
4. £5 11*s.* 8*d.*, £6 1*s.* 3*d.*, £5 18*s.* 1*d.*
5. 1 ft. 7½ in., 2 ft. 1¾ in., 1 ft. 10½ in., 2 ft. 2¼ in.
6. 5 lb. 8 oz., 6 lb. 12 oz., 7 lb. 2 oz., 5 lb. 10 oz.

Set G. Areas and Volumes

1. Find the area of a sheet of cardboard 10½ in. long and 5½ in. wide.
2. Find the area of a sheet of cardboard 10·5 in. long and 5·5 in. wide. Work in decimals and compare your answer with the answer to Question 1.
3. What is the perimeter of a picture 8·75 in. long and 4·5 in. wide?
4. What is the perimeter of a picture 8¾ in. long and 4½ in. wide? Compare your answer with the answer to Question 3.
5. What is the volume of a rectangular box, 8 in. long, 3½ in. wide and 2½ in. deep?
6. What is the volume of a rectangular box, 8 in. long, 3·5 in. wide and 2·5 in. deep? Compare your answer with the answer to Question 5.



VI. SHOPPING

EXERCISE 14. FINDING THE COST OF 1 LB., 1 YD., Etc.

1. Find the cost of:
  (*a*) 1 lb. of meat, if 7 lb. costs 9*s*. 0½*d*.
  (*b*) 1 yd. of dress material, if 11 yd. cost £2 11*s*. 4*d*.
  (*c*) 1 gal. of oil, if 36 gal. cost £1 8*s*. 6*d*.
  (*d*) 1 ft. of wood, if 53 ft. cost 11*s*. 0½*d*.

Find the cost of 1 lb. when $3\frac{3}{8}$ lb. cost 4s. 6d

$3\frac{3}{8}$ lb. cost 4s. 6d. or $4\frac{1}{2}$s.

$$\textbf{1 lb. costs } \left(4\frac{1}{2} \div 3\frac{3}{8}\right)\text{s.} = \left(\frac{\overset{1}{\cancel{9}}}{\underset{1}{\cancel{2}}} \times \frac{\overset{4}{\cancel{8}}}{\underset{3}{\cancel{27}}}\right)\text{s.} = \frac{4}{3}\text{s.} = \text{1s. 4d.}$$

or

$3\frac{3}{8}$ lb. cost 4s. 6d. or 54d.

$$\textbf{1 lb. cost } \left(54 \div 3\frac{3}{8}\right)\text{d.} = \left(\frac{\overset{2}{\cancel{54}}}{1} \times \frac{8}{\underset{1}{\cancel{27}}}\right)\text{d.} = \text{16d.} = \text{1s. 4d.}$$

2. (*a*) 2¾ yd. of cloth cost 16*s*. 6*d*. Find the cost of 1 yd.
  (*b*) 3¼ yd. of calico cost 6*s*. 6*d*. What is the cost per yard?
  (*c*) 4¾ yd. of ribbon cost 2*s*. 4½*d*. Find the cost per yard.
  (*d*) 8½ yd. of serge cost £4 5*s*. What is the cost per yard?

3. (*a*) 10½ sq. yd. of linoleum cost 31*s*. 6*d*. Find the cost per square yard.
  (*b*) 8⅞ doz. caps cost £10 13*s*. What is the cost per dozen?
  (*c*) Find the cost of 1 cwt. of rubble, if 7½ cwt. cost £1 3*s*. 9*d*.
  (*d*) Find the cost of 1 yd. of silk, if 2⅚ yd. cost 5*s*. 8*d*.

EXERCISE 15. FINDING THE COST OF MORE THAN 1 LB., 1 YD., Etc.

1. Find the cost of:
- (*a*) 3½ lb. of ham at 3*s*. per pound.
- (*b*) 2 lb. 12 oz. of bacon at 1*s*. 8*d*. a pound.
- (*c*) 4 gal. 3 qt. of milk at 2*s*. 4*d*. a gallon.
- (*d*) 5½ doz. eggs at 2*s*. 8*d*. a dozen.
- (*e*) 7¼ yd. of ribbon at 10*d*. a yard.

2. Find the cost of:
- (*a*) 6½ dozen eggs at 2*s*. 8*d*. a dozen.
- (*b*) 30 oranges at 5 for 9*d*.
- (*c*) 2 doz. bananas at 3 for 4*d*.
- (*d*) 3 lb. 6 oz. of mutton at 1*s*. 4*d*. per pound.
- (*e*) 7½ yd. of carpet at 4*s*. 11*d*. a yard.

Find the cost of 5½ lb. when 3¼ lb. cost 6s. 6d.

$$3\frac{1}{4}\text{ lb. cost } 6\frac{1}{2}\text{s.}$$

$$1\text{ lb. costs }\left(6\frac{1}{2} \div 3\frac{1}{4}\right)\text{s.}$$

$$5\frac{1}{2}\text{ lb. cost }\left(6\frac{1}{2} \div 3\frac{1}{4} \times 5\frac{1}{2}\right)\text{s.}$$

$$= \left(\frac{\overset{1}{\cancel{13}}}{\underset{1}{\cancel{2}}} \times \frac{\overset{\overset{1}{\cancel{2}}}{\cancel{4}}}{\underset{1}{\cancel{13}}} \times \frac{11}{\underset{1}{\cancel{2}}}\right)\text{s.} = 11\text{s.}$$

3. (*a*) 5 lb. of sugar cost 2*s.* 1*d.* Find the cost of 10½ lb.

(*b*) 4 lb. of bacon cost 5*s.* 4*d.* What will 6½ lb. cost?

(*c*) 8 qt. of milk cost 4*s.* 8*d.* What must be paid for 10½ qt.?

(*d*) 6 yd. of curtain material cost 21*s.* Find the cost of 11¾ yd.

4. (*a*) 2½ yd. of muslin cost 5*s.* 10*d.* Find the cost of 4 yd.

(*b*) 1½ cwt. of coal cost 5*s.* 6*d.* What will 5 cwt. cost?

(*c*) 6½ lb. of beef cost 10*s.* 10*d.* Find the cost of 10½ lb.

(*d*) A man earns 14*s.* 8*d.* for 5½ hours' work. What will he earn for 7½ hours' work?

What weight of coal can I buy for £14, if I pay £6 2s. 6d. for 3½ tons?

$$\text{£}6\tfrac{1}{8} \text{ will buy } 3\tfrac{1}{2} \text{ tons}$$

$$\text{£}1 \text{ will buy } \left(3\tfrac{1}{2} \div 6\tfrac{1}{8}\right) \text{ ton}$$

$$\text{£}14 \text{ will buy } \left(3\tfrac{1}{2} \div 6\tfrac{1}{8} \times 14\right) \text{ tons}$$

$$= \left(\frac{\overset{1}{\cancel{7}}}{\underset{1}{\cancel{2}}} \times \frac{\overset{4}{\cancel{8}}}{\underset{\underset{1}{\cancel{7}}}{\cancel{49}}} \times \frac{\overset{2}{\cancel{14}}}{1}\right) \text{ tons} = 8 \text{ tons.}$$

In the above example, as the answer is to be TONS, the first line is written so that TONS is on the right of the page; that is, we write: £6⅛ will buy 3½ tons, and NOT 3½ tons cost £6⅛.

5. How many gallons of petrol would you expect to use on a journey of 266 miles, if it required 4½ gallons for 126 miles?

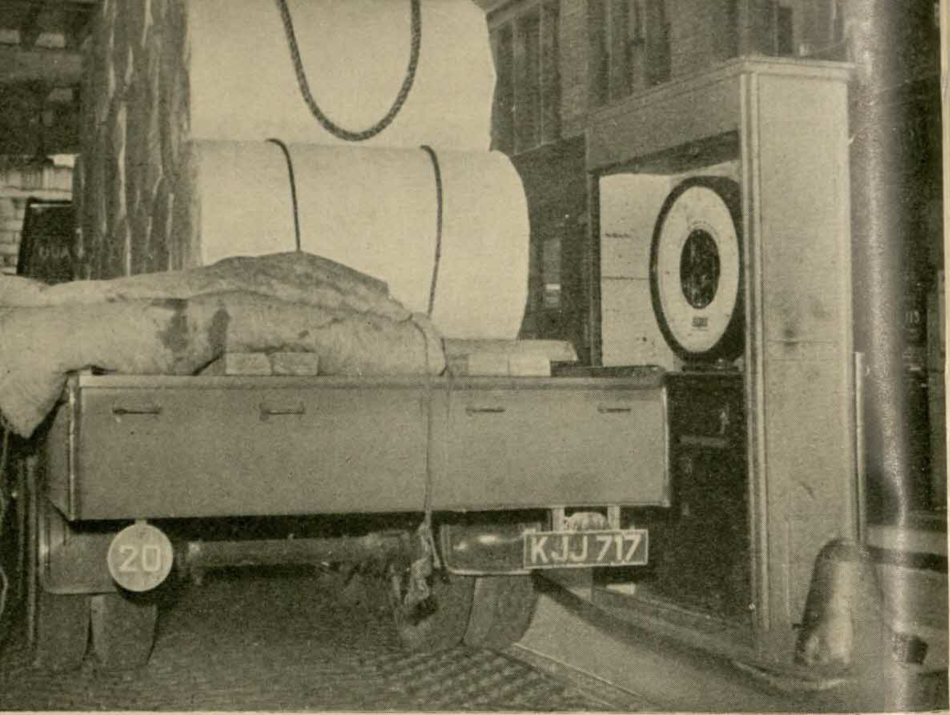
6. A man, paid by the hour, received 37*s.* 4*d.* for 14 hours' work. How many hours must he work to receive £3?

7. How many yards of ribbon can be bought for 4*s.* 9*d.* when 5¾ yards cost 5*s.* 9*d.*?

8. If 3½ rolls of roofing-felt cost £2 2*s.* 0*d.*, how many rolls can be bought for £3?

9. It was found that an electric fire used 7½*d.* worth of electricity in 3 hr. 20 min. How long can this fire be used for 1*s.* 0*d.*?

10. If I paid a gardener £2 11*s.* for 24 hours, how many hours would you expect him to work for £4 5*s.*?



EXERCISE 16. THE COST OF GOODS SOLD BY WEIGHT AND BY MEASURE

1. If a ton of coal cost £3 10*s*., find the cost of:
(*a*) 10 cwt. (½ of 1 ton); (*b*) 5 cwt. (½ of 10 cwt.); (*c*) 6 tons.

2. From your answers to Question 1, find the cost of 6 tons 15 cwt. of coal at £3 10*s*. a ton.

3. If a stone of flour costs 2*s*. 10*d*., find the cost of :
(*a*) 7 lb. (½ of 1 st.) ; (*b*) 3½ lb. (½ of 7 lb.); (*c*) 3 st.

4. From your answers to Question 3, fill in the missing amounts in the sum below, and find the cost of 3 st. 10½ lb. of flour at 2*s*. 10*d*. a stone.

s. *d*.
2 10 = cost of 1 st.

= cost of 3 st.
= cost of 7 lb.
= cost of 3½ lb.

= cost of 3 st. 10½ lb.

5. If gravel is sold at 13*s*. 4*d*. a ton, find the cost of:
(*a*) 5 cwt. (¼ of 1 ton); (*b*) 2 cwt. ($\frac{1}{10}$ of 1 ton);
(*c*) 2 qr. (¼ of 2 cwt.); (*d*) 5 tons.

6. Copy, and complete, the sum below to find the cost of 5 tons 7 cwt. 2 qr. of gravel at 13*s.* 4*d.* a ton.

£ *s.* *d.*
13 4 = cost of 1 ton
= cost of 5 tons
= cost of 5 cwt.
= cost of 2 cwt.
= cost of 2 qr.
= cost of 5 tons 7 cwt. 2 qr.

7. Copy, and complete, the sum below to find the cost of 4 yd. 1 ft. 8 in. of material at 4*s.* 6*d.* a yard. Note that 1 ft. 6 in. is $\frac{1}{2}$ of a yard, and 2 inches is $\frac{1}{9}$ of 1 ft. 6 in.

s. *d.*
4 6 = cost of 1 yd.
= cost of 4 yd.
= cost of 1 ft. 6 in.
= cost of 2 in.
= cost of 4 yd. 1 ft. 8 in.

8. Find the cost of:

(*a*) 5 yd. 2 ft. 3 in. at 2*s.* 8*d.* a yard. (Take 1 ft. 6 in. and 9 in.)
(*b*) 4 yd. 1 ft. 9 in. at 3*s.* 6*d.* a yard.
(*c*) 6 yd. 2 ft. 3 in. at 2*s.* 10*d.* a yard.
(*d*) 7 yd. 1 ft. 8 in. at 4*s.* 6*d.* a yard.

9. Find the cost of :

(*a*) 7 cwt. 2 qr. 14 lb. at £2 3*s.* 4*d.* a hundredweight. (Take 2 qr. and 14 lb.)
(*b*) 3 cwt. 3 qr. at £1 3*s.* 6*d.* a hundredweight.
(*c*) 5 cwt. 2 qr. 21 lb. at £1 12*s.* a hundredweight.
(*d*) 9 cwt. 3 qr. 7 lb. at 17*s.* 4*d.* a hundredweight.

10. Find the cost of:

(*a*) 3 tons 12 cwt. at £1 6*s.* 8*d.* a ton.
(*b*) 8 st. 9 lb. at 4*s.* 1*d.* a stone.
(*c*) 12 cwt. 1 qr. 14 lb. at £1 3*s.* 4*d.* a hundredweight.
(*d*) 7 gal. 3 qt. 1 pt. at 3*s.* 8*d.* a gallon.
(*e*) 15 yd. 1 ft. 10 in. at 2*s.* 3*d.* a yard.

VII. OUR TRADESMEN

EXERCISE 17. THE MILKMAN

LEARN

To find the cost of a dozen, when given the cost of one, call the pence shillings.

$3\frac{1}{4}$d. each = $3\frac{1}{4}$s. (3s. 3d.) a dozen.

To find the cost of one, when given the cost of a dozen, call the shillings pence.

2s. 9d. ($2\frac{3}{4}$s.) a dozen = $2\frac{3}{4}$d. each.

1. Find the cost, at $4\frac{1}{2}$d. a pint, of:
(*a*) 12 pt.; (*b*) 13 pt.; (*c*) 10 pt.;
(*d*) 24 pt.; (*e*) 23 pt.; (*f*) 47 pt.,

2. (*a*) How many pint bottles can be filled from a churn holding 10 gal. of milk?

(*b*) How many half-pint bottles can be filled with milk from a bucket containing $2\frac{1}{2}$ gal.?

3. In one week a school received the following number of bottles of milk. Each bottle holds $\frac{1}{3}$ pt. Find (*a*) the total number of bottles, and (*b*) the number of gallons of milk supplied to this school in this week.
Monday, 57; Tuesday, 49; Wednesday, 52;
Thursday, 59; Friday, 47.

4. (*a*) During a certain week, a woman paid 3*s*. 10*d*. for $11\frac{1}{2}$ pt. of milk. What was the cost of 1 pt.?

(*b*) How much would she pay for 17 pt. at this price?

(*c*) How many pints of milk could she buy for 4*s*. 10*d*.?

5. (*a*) In an ice-cream factory, the mixture is stored in tanks holding 1,000 gal. How many cartons can be filled from this tank if each carton holds $\frac{1}{4}$ pt. of ice-cream?

(*b*) What would be the value of this ice-cream at 3*d*. a carton?

6. The table below shows the number of bottles of milk supplied to a school for the month of March.

(*a*) How many bottles were used during the first two school days in this month?

(*b*) How many bottles were used on the four Mondays of this month?

(*c*) By adding down and across, complete the empty spaces and find the grand total.

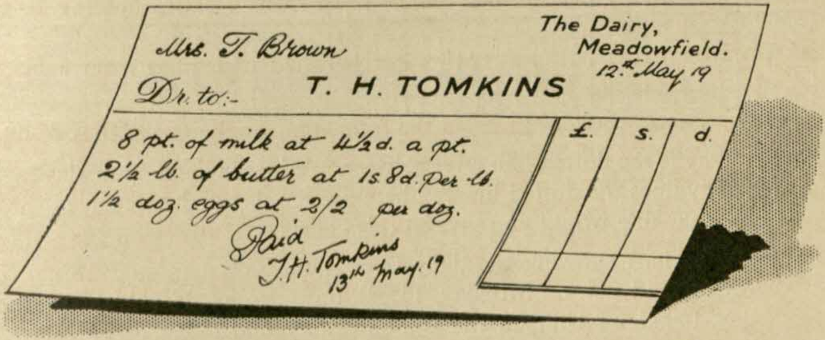
(*d*) What is the average number of bottles used per day?

(*e*) How many gallons of milk were supplied to this school during March, if each bottle contained ⅓ pt.?

MARCH

Sun	- -	- -	- -	- -	- -	Total
M	- -	38	40	39	43	
T	- -	45	42	36	40	
W	- -	47	39	38	40	
Th	43	42	46	39	42	
F	45	50	48	42	40	
Sat.	- -	- -	- -	- -	- -	
Total						

7. Copy, and complete the following bill.



The Dairy,
Meadowfield.
12th May 19

Mrs. T. Brown

Dr. to:- T. H. TOMKINS

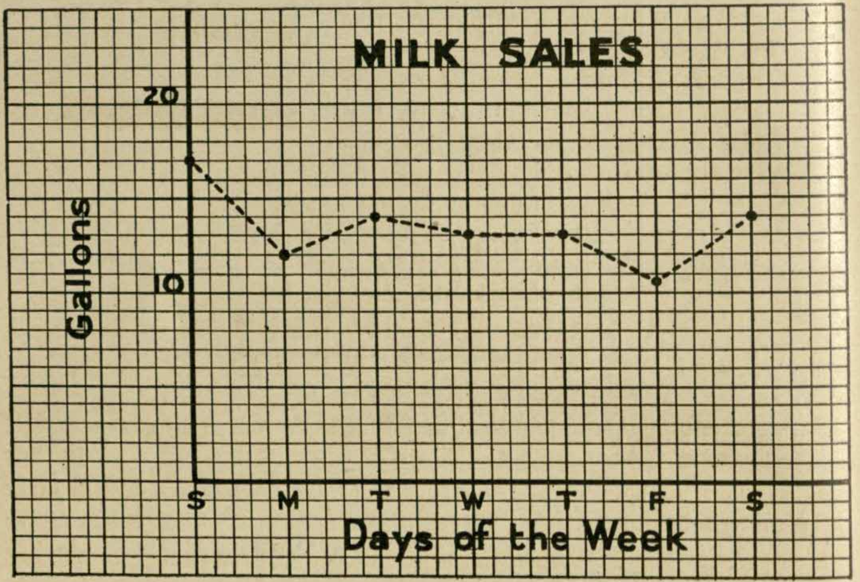
	£.	s.	d.
8 pt. of milk at 4½d. a pt.			
2½ lb. of butter at 1s 8d. per lb.			
1½ doz. eggs at 2/2 per doz.			

Paid
J.H. Tomkins
13th May 19

8. Mrs. Brown has 1 pt. of milk each weekday and 1 qt. on Sundays. She also buys 2½ lb. of butter and 1½ doz. eggs each Wednesday. Make out her bill for the month of March, if milk is 4½*d*. a pint; butter, 1*s*. 8*d*. per pound; and eggs, 2*s*. 9*d*. per dozen. (Allow for four Sundays and five Wednesdays.)

9. During a certain week, a milkman sold $12\frac{1}{2}$ gal. of milk on Monday, $13\frac{7}{8}$ gal. on Tuesday, $11\frac{3}{4}$ gal. on Wednesday, $14\frac{3}{8}$ gal. on Thursday, $13\frac{1}{2}$ gal. on Friday, $14\frac{7}{8}$ gal. on Saturday, and $22\frac{3}{8}$ gal. on Sunday.
   (*a*) Find the total number of gallons he sold in the week.
   (*b*) What was the average number of gallons sold daily?

10. Look at the chart below:
   (*a*) How much milk was sold on Monday?
   (*b*) On which day did the milkman sell the greatest quantity of milk? How many gallons were sold on this day?
   (*c*) On which day did he sell the least amount of milk? How many gallons were sold on this day?



   (*d*) Why is the dotted line level between Wednesday and Thursday?
   (*e*) Why does the dotted line fall between Sunday and Monday?
   (*f*) What title would you give to this chart?

11. Draw a chart showing the daily sales if the milkman sold 16 gal. on Sunday, 14 gal. on Monday, 15 gal. on Tuesday, 13 gal. on Wednesday, 14 gal. on Thursday, 12 gal. on Friday, and 14 gal. on Saturday.

12. Using the same chart as in Question 11, draw a line which would show that a milkman sold 14 gallons on each day of the week.

EXERCISE 18. THE GROCER

1. What change should you receive on handing the grocer a £1 note to pay for the following goods?

$1\frac{1}{2}$ lb. of cheese at 1*s.* 4*d.* per lb.;
6 lb. of sugar at 2 lb. for $10\frac{1}{2}$*d.*;
$2\frac{1}{2}$ lb. of butter at 1*s.* 8*d.* per lb.;
16 eggs at 2*s.* 9*d.* a dozen.

2. Make out a bill for the following provisions, which were bought from B. W. Woods, 17, High Street, Oulton, by Mrs. F. Birch on 13th March this year. Receipt your bill to show that Mrs. Birch paid for these goods on the same day.

7 lb. of flour at 2*s.* 10*d.* a stone;
$\frac{3}{4}$ lb. of tea at 2*s.* 4*d.* a pound;
3 tins of cocoa at $5\frac{1}{2}$*d.* a tin;
5 lb. of sugar at $5\frac{1}{2}$*d.* a pound;
2 lb. 8 oz. of ham at 2*s.* 8*d.* a pound;
4 lb. of butter at 1*s.* $9\frac{1}{2}$*d.* a pound;
9 eggs at 2*s.* 6*d.* a dozen.

3. A grocer bought a 56-lb. tub of butter for £4 0*s.* 8*d.*, and sold it at 1*s.* $8\frac{1}{2}$*d.* a pound. What profit did he make?

4. A grocer bought 3 cwt. of sugar for £6 6*s.* 0*d.* What profit will he make if he sells this sugar at 2 lb. for $10\frac{1}{2}$*d.*?

5. Cigarettes may be bought in packets of five at 8*d.* a packet, or in boxes of one hundred at 13*s.* a box. If a man smokes 60 cigarettes a week, what could he save in 10 weeks by buying his cigarettes in boxes instead of in packets?

6. If $5\frac{1}{2}$ lb. of lard cost 4*s.* 7*d.*, how much can be bought for 2*s.* 6*d.*?

7. A grocer mixes 5 lb. of tea at 2*s.* 10*d.* a pound with 3 lb. of tea at 2*s.* 2*d.* a pound. How much is a pound of the mixture worth?

8. A grocer bought eggs at 2*s.* 2*d.* a dozen and sold them at the rate of 9 for 2*s.* What profit would he make on a box containing 720 eggs?

9. A grocer bought 5 cwt. of flour for £4 13*s.* 4*d.* What profit will he make if he sells it at 2*s.* 10*d.* a stone ?

10. If $1\frac{1}{2}$ cwt. of tea cost a grocer £16 16*s.*, how many pounds of tea can he buy for £10?

EXERCISE 19. THE BAKER

1. Find the cost of:
   (*a*) 48 buns at 1*d.* each;
   (*b*) 60 rolls at 1¼*d.* each;
   (*c*) 72 cakes at 1½*d.* each;
   (*d*) 96 loaves at 2*d.* each.

2. Find the cost of:
   (*a*) 48 loaves at 3*d.* each;
   (*b*) 24 Vienna rolls at 3½*d.* each;
   (*c*) 36 currant loaves at 4*d.* each;
   (*d*) 60 white loaves at 4½*d.* each.

3. Find the value of (*a*) 750 threepences;
   (*b*) 750 halfpence; and from your answers find:
   (*c*) the value of 3½*d.* × 750.

4. (*a*) What is the value of 432 threepences?
   (*b*) From your last answer, find the value of 1½*d.* × 432.
   (*c*) From your answers to (*a*) and (*b*) find the value of 4½*d.* × 432.

5. A baker delivered the following number of loaves in a week: Monday, 134; Tuesday, 147; Wednesday, 128; Thursday, 142; Friday, 138; and Saturday, 205.
   (*a*) What was the total number of loaves delivered?
   (*b*) What was the value of these loaves at 4½*d.* each?
   (*c*) What was the daily average number of loaves sold?

6. (*a*) 1 lb. of bread can be made from ⅔ lb. flour. What weight of flour will be used for a 2-lb. loaf?
   (*b*) How many 2-lb. loaves can a baker make from 140 pounds of flour?
   (*c*) What would be the total weight of these loaves in cwt. qr. lb.?

7. A baker has four vans delivering bread. The table at the top of page 45 shows the number of loaves sold by each vanman during a week.
   (*a*) Make a copy of the table and, by adding downwards and across, find (i) the number sold by each vanman during the week; (ii) the number of loaves sold each day; and (iii) the grand total of loaves sold for the week.
   (*b*) If each loaf was sold for 4½*d.*, find the total sum of money received for the sale of bread during the week.
   (*c*) Check your last answer by finding the sum of money received each day.
   (*d*) Find the average daily takings for the sale of bread.

Day of week	No. 1 van	No. 2 van	No. 3 van	No. 4 van	Total
Monday	129	156	69	146	
Tuesday	157	176	57	166	
Wednesday	184	147	38	131	
Thursday	124	198	85	149	
Friday	178	156	78	136	
Saturday	244	255	125	208	
TOTAL					

8. A sack of flour contains 280 lb. Express this weight in cwt. and qr.

9. What weight of flour will be used in making *two hundred and forty* 2-lb loaves? Give your answer in cwt. qr. lb. (See Question 6).

10. Before placing in the oven, the dough (flour, yeast, and water) for a 2-lb. loaf weighs $2\frac{1}{4}$ lb.

(*a*) What weight of dough would be required for *five hundred and sixty* 2-lb. loaves? Give your answer in cwt. qr.

(*b*) How many 2-lb. loaves can be made from 144 lb. of dough?

11. $2\frac{1}{4}$ lb. of dough contains $1\frac{1}{3}$ lb. of flour. What is the weight of yeast and water in the dough? Give your answer in ounces.

12. State the correct change you would give to customers making the following purchases:

(*a*) 2 loaves at 4*d*. each. The customer gives you 1*s*.

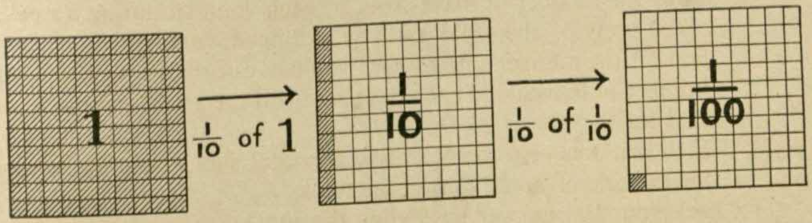
(*b*) $\frac{1}{4}$ stone of flour at 2*s*. 8*d*. per stone. The customer gives you a half-crown.

(*c*) 1 Dundee cake at 1*s*. 4*d*.; 2 Swiss rolls at 10*d*. each. The customer gives you a 10*s*. note.

(*d*) 15 fancy cakes at $1\frac{1}{2}$*d*. each. The customer gives you 2*s*. 6*d*.

(*e*) $3\frac{1}{2}$ lb. of cake at 1*s*. 2*d*. a lb. The customer gives you a 10*s*. note.

TENTHS AND HUNDREDTHS

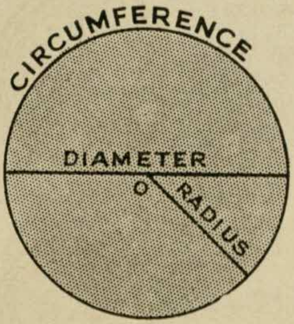


VIII. TRIANGLES

SOMETHING TO READ: A MOVING POINT

1. (*a*) On your paper mark two points, O and A, 1 in. apart. Now mark another point, B, which is also 1 in. from O. Mark another point, C, which is 1 in. from O. How many points can you find which are 1 in. from O?

(*b*) Now suppose the point O to be fixed so that it cannot move, but that the point A moves so that it is always 1 in. from O. Try to draw the path which the point A would make.



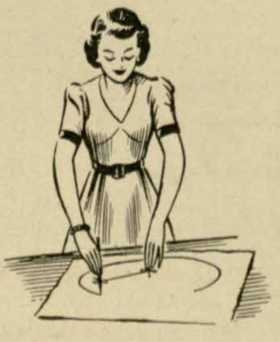
This path is called the **circumference of a circle**, and can easily be drawn with your compasses. The point of the compasses must be kept on the point O and the distance between the legs of the compasses must not change while the path is being drawn. The distance between the legs is called the **radius** of the circle, and the fixed point O is called the **centre** of the circle. A straight line drawn across the circle through the centre is a **diameter** of the circle; it is twice as long as the radius.

2. Look at the illustration showing a woman marking out a circular pattern on a sheet of paper.

(*a*) In which hand is she holding the moving point?

(*b*) Where is the fixed point, or centre, of her circle?

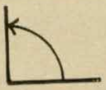
(*c*) What is she using to keep the moving point at a fixed distance from the centre?



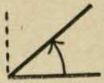
EXERCISE 20. THE CLOCKFACE

LEARN

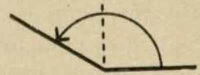
A RIGHT-ANGLE is a quarter of a complete turn. It contains 90 degrees.

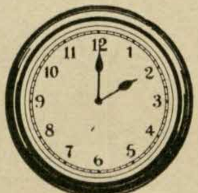


An ACUTE ANGLE is smaller than a right-angle. It contains less than 90 degrees.



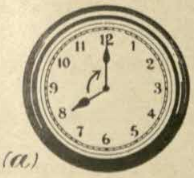
An OBTUSE ANGLE is greater than a right-angle. It contains more than 90 degrees.



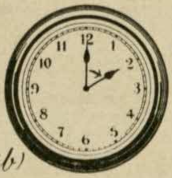


1. The minute-hand of a clock makes one complete turn, or *revolution*, every hour. Through how many degrees does this hand move in:
(*a*) 15; (*b*) 30; (*c*) 45; (*d*) 20;
(*e*) 5; (*f*) 1; (*g*) 25; (*h*) 35 minutes?

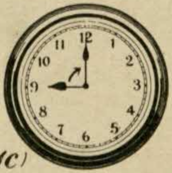
2. How many degrees are there in each of the angles shown below? State whether these are *acute*, *obtuse*, or *right* angles.



(*a*)

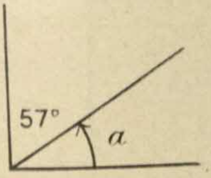


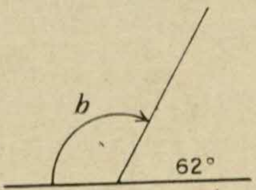
(*b*)

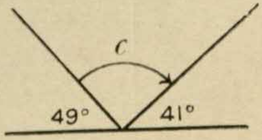


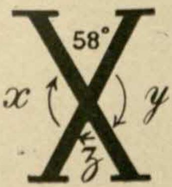
(*c*)

3. Give the number of degrees in the angles denoted by the letters *a*, *b*, and *c* below, and say in each case whether it is an acute, an obtuse, or a right-angle.









4. (*a*) In the letter X, the size of one of the angles is given. How many degrees are there in each of the three angles *x*, *y*, *z*?

(*b*) If the size of the given angle were 78°, what would be the size of each of the other angles in this letter X? Draw a sketch.

EXERCISE 21. DRAWING TRIANGLES

LEARN

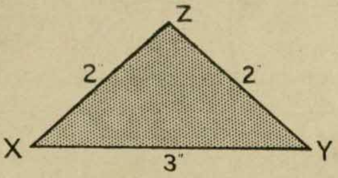
A figure of three sides is called a TRIANGLE. It has three angles.

1. Draw a line AB, 2 in. long. Open the legs of your compasses until the distance between them is 3 in. Place the point of the compass on A and draw the path of a point which is always 3 in. from A. Draw the path of a point which is always 3 in. from B. Can you find a point which is 3 in. from A and 3 in. from B? How many such points can you find? Mark one of these points with the letter C, and draw lines from C to A and to B.

LEARN

An ISOSCELES triangle has TWO of its sides equal. (*Isosceles* means *equal legs*).

2. Draw an isosceles triangle XYZ, having XY = 3 in., and XZ and YZ each 2 in.



3. (*a*) Draw a line, DE, 3 in. long. As in Question 1, find a point which is 3 in. from D and 3 in. from E. Mark this point with the letter F, and draw the lines DF and EF.
   (*b*) Is this figure an isosceles triangle? Why?

LEARN

An EQUILATERAL triangle has THREE sides of equal length.
An equilateral triangle is also an isosceles triangle.

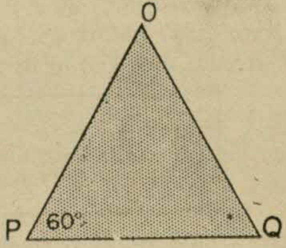
4. Draw an equilateral triangle having each of its sides 2 in. long.
5. (*a*) Draw any straight line GH, 4 in. long. Draw the path of a point which is always 3 in. from G. Draw the path of a point which is always 2 in. from H. Mark this point with the letter K, and draw the lines KG and KH.
   (*b*) Is this triangle an isosceles triangle? Give your reason.
   (*c*) Is GHK an equilateral triangle? Give your reason.

LEARN

A SCALENE triangle has three UNEQUAL sides.

6. Draw a scalene triangle having sides of 3 in., 2 in., and 2½ in.

7. (*a*) Measure the angles of the triangle ABC (Question 1) with your protractor. What do you notice?
   (*b*) Measure the angles of the triangle XYZ (Question 2). What do you notice?
   (*c*) OPQ is an equilateral triangle, having the angle OPQ = 60°. What is the size of the angle OQP? What is the size of the angle POQ?



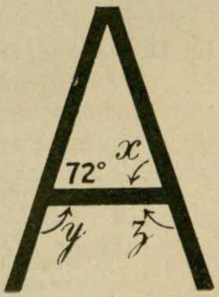
   (*d*) Measure the angles of the equilateral triangles drawn in Questions 3 and 4.
   (*e*) Measure the angles of the scalene triangles in Questions 5 and 6.
   (*f*) Copy, and complete the following sentences:

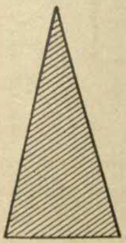
An **equilateral** triangle has . . . equal sides and . . . equal angles Each of these angles contains . . . degrees.

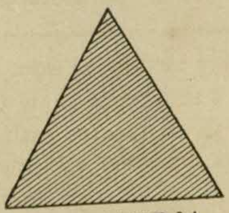
An **isosceles** triangle has . . . equal sides and . . . equal angles.

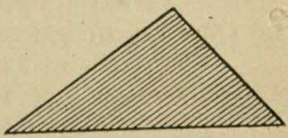
A **scalene** triangle has . . . equal sides and . . . equal angles.

8. (*a*) In the letter A, the size of one of the angles is given. How many degrees are there in each of the angles *x*, *y*, *z*?
   (*b*) If the given angle were 55°, how many degrees would there be in each of the other angles?




ISOSCELES


EQUILATERAL


SCALENE

IX. OTHER TRADESMEN

EXERCISE 22. THE BUTCHER

LEARN

¼d. per oz. = 4d. per lb.

1. (*a*) What is the cost of 4 oz. at:
(i) 2*s.*; (ii) 2*s.* 4*d.*; (iii) 3*s.*;
(iv) 4*s.*; (v) 5*s.* 8*d.* per lb?
(*b*) Find the cost of 1 oz. at each of these prices.

Note.—In questions 2 to 5, the prices are to be taken from the first (English) column of the meat price list below.

2. Find the cost of:
(*a*) 3 lb.; 2½ lb.; 4¼ lb.; 1¾ lb.; 5 lb. 3 oz. of steak.
(*b*) 5 lb.; 7½ lb.; 9¼ lb.; 6¾ lb.; 4 lb. 4 oz. rib of beef.
(*c*) 3¼ lb.; 4¾ lb.; 2 lb. 8 oz.; 5 lb. 4 oz. loin of beef.
(*d*) 3¼ lb.; 5½ lb.; 4¾ lb.; 7½ lb.; 8¾ lb. neck of mutton.
(*e*) 3 lb.; 4½ lb.; 5¾ lb.; 7½ lb.; 8¼ lb. leg of mutton.

3 lb. 5 oz. at 1*s. per pound cost* 3*s.* 3¾*d. The butcher would consider the price of this joint to be* 3*s.* 4*d.*

3. Here is a woman's meat bill for a week. Find the total of her bill.
3 lb. of beef steak.
4 lb. of stewing steak.
8 oz. of beef suet.

4. Find the total cost of:
10 oz. of kidney.
3 lb. 6 oz. of stewing steak.
1 lb. 8 oz. of oxtail.
1 lb. 4 oz. of pork sausages.

5. Make out and total a bill for Mrs. Cambridge, who bought the following from F. E. Oxford, Butcher, High Street, Sheffield, to-day:
5 lb. 6 oz. of pork.
1 lb. 8 oz. of liver.
3 lb. 12 oz. of pork sausages.
2 lb. 8 oz. of shin of beef.

		ENGLISH	IMPORTED
BACON	- back	2s. 7d.	2s. 6d.
	- streaky	2s. 6d.	2s. 4d.
BEEF	- steak	2s. 8d.	—
	- loin	2s. 2d.	—
	- rib	2s. 2d.	—
	- suet	1s. 4d.	—
	- stewing steak	1s. 6d.	—
	- shin	1s. 6d.	—
	- sirloin	2s. 2d.	1s. 10d.
	- silverside	2s. 2d.	1s. 10d.
	- topside	2s. 2d.	1s. 10d.
LAMB	- shoulder	2s. 4d.	2s. 0d.
MUTTON	- neck	1s. 6d.	—
	- leg	2s. 4d.	1s. 8d.
	- loin	2s. 4d.	2s. 0d.
PORK		2s. 0d.	—
	- sausage	1s. 6d.	—
KIDNEY		2s. 4d.	—
OXTAIL		1s. 6d.	—
LIVER		2s. 2d.	—

6. From the list of prices, find the cost of:

(*a*) 2½ lb. of English sirloin; (*b*) 5¼ lb. of English silverside; (*c*) 3 lb. 12 oz. of English topside.

7. Find the difference between English and Imported prices for the following:

(*a*) 8 lb. leg of mutton; (*b*) 3 lb. 8 oz. shoulder of lamb; (*c*) 2½ lb. loin of mutton.

8. If a family uses 3½ lb. of bacon each week, find the difference in cost between the English and imported bacon, both (*a*) for *back* and (*b*) for *streaky*.

9. (*a*) If 7½ lb. of meat cost 8*s*. 9*d*., what ought to be paid for 4½ lb.?

(*b*) What weight of mutton would 6*s*. 1½*d*. buy at 1*s*. 9*d*. a lb.?

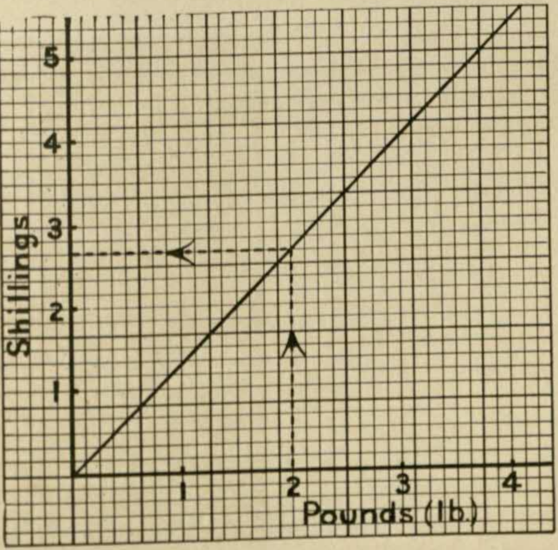
10. During four weeks, a woman bought the following weights of bacon: 2¾ lb.; 3$\frac{11}{16}$ lb.; 2$\frac{9}{16}$ lb.; 3½ lb. What was the average weekly weight of the bacon she bought?

11. A butcher, who is selling meat at 1*s*. 4*d*. per pound, has drawn the chart below to show the price of any joint less than 4 lb.

(*a*) By following the dotted line in the direction shown by the arrows, you will see that 2 lb. of meat cost 2*s*. 8*d*. From the chart, find the cost of:

(i) 1½ lb.; (ii) 2 lb. 4 oz.; (iii) 3 lb. 10 oz.; (iv) 1 lb. 12 oz.; and (v) 3 lb. 5 oz. of meat.

(*b*) By following the dotted line in the opposite direction, you will see that for 2*s*. 8*d*. you can buy 2 lb. of meat. From the chart, find the weight of meat which could be bought for: (i) 1*s*. 6*d*.; (ii) 3*s*. 6*d*.; (iii) 5*s*.; (iv) 2*s*. 11*d*.; and (v) 4*s*. 7*d*.



EXERCISE 23. THE COAL MERCHANT

LEARN

To find the cost of a ton when given the cost of a hundredweight, call the number of shillings, pounds.

2s. 9d. (2¾s.) per cwt. = £2¾ (£2 15s.) a ton.

To find the cost of a hundredweight when given the cost of a ton, call the number of pounds, shillings.

£3 5s. (£3¼) a ton = 3¼s. (3s. 3d.) per cwt.

1. What is the cost of 1 ton if a hundredweight costs:

(*a*) 1*s*. (*b*) 2*s*. (*c*) 2*s*. 3*d*.
(*d*) 1*s*. 6*d*. (*e*) 1*s*. 4½*d*. (*f*) 1*s*. 10½*d*.
(*g*) 2*s*. 2*d*. (*h*) 2*s*. 9*d*. (*i*) 3*s*. 1*d*.?

2. What is the cost of 1 cwt. if a ton costs:

(*a*) £1 (*b*) £3 (*c*) £1 5*s*.
(*d*) £2 15*s*. (*e*) £1 12*s*. 6*d*. (*f*) £1 13*s*. 4*d*.
(*g*) £2 1*s*. 8*d*. (*h*) £1 16*s*. 8*d*.?

3. What weight of coal will be left from a stock of 35 tons after selling: 1 ton 15 cwt. 2 qr.; 3½ tons; 2 tons 17 cwt.; 3 tons 12 cwt. 3 qr.; and 8¼ tons?

4. (*a*) During a term of 15 weeks, a caretaker used 72 tons of coal. Find the average weight he used each week.

(*b*) Using the average weight found in (*a*) above, find the weight of coal which this caretaker would expect to use in a term of 13 weeks.

5. A woman finds that on an average she uses three scuttles of coal each day. If the scuttle holds 17 lb. of coal, find how long 12 cwt. 3 qr. of coal should last her.

6. From the quantities given below, find the average daily amount of coal used:
Monday, 1 qr. 10 lb.; Tuesday, 1 qr. 17 lb.; Wednesday, 1 qr. 2 lb.; Thursday, 2 qr. 3 lb.; Friday, 1 qr. 12 lb.; Saturday, 1 qr. 21 lb.; Sunday, 2 qr. 12 lb.

7. Find the cost of 3 tons 7 cwt. 2 qr. of coal at £3 16*s*. 8*d*. a ton.

8. If 5½ tons of coal cost £19 5*s*. 0*d*., what should be the cost of 2 tons 18 cwt. of this coal?

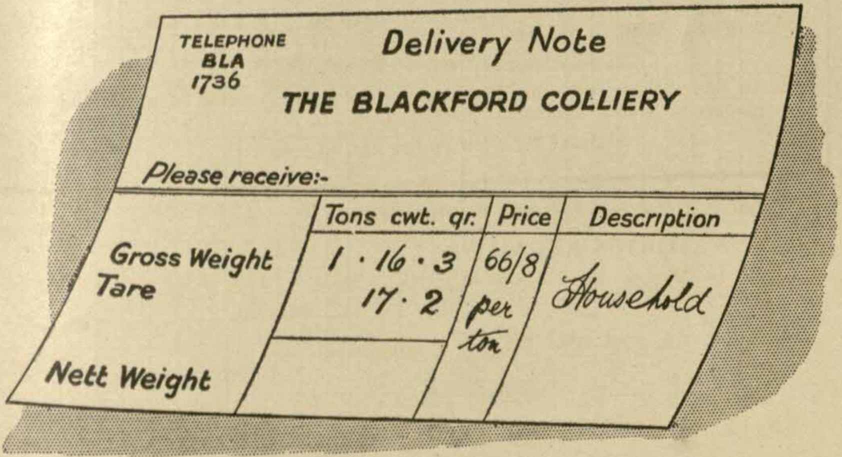
9. Coal may be bought in small quantities at 3*s*. 8*d*. per hundredweight, or in larger quantities at £3 12*s*. 0*d*. a ton. Find the amount which would be saved by buying 2 tons 10 cwt. of coal at one time instead of buying it in small quantities of 1 cwt. each.

10. When a supply of coal is sent to your house, the carrier brings a **delivery note.**

Gross weight is the weight of the coal and the lorry.

Tare is the weight of the lorry.

Nett weight is the actual weight of the coal.



TELEPHONE
BLA
1736

Delivery Note

THE BLACKFORD COLLIERY

Please receive:-

	Tons cwt. qr.	Price	Description
Gross Weight	1 · 16 · 3	66/8 per ton	Household
Tare	17 · 2		
Nett Weight			

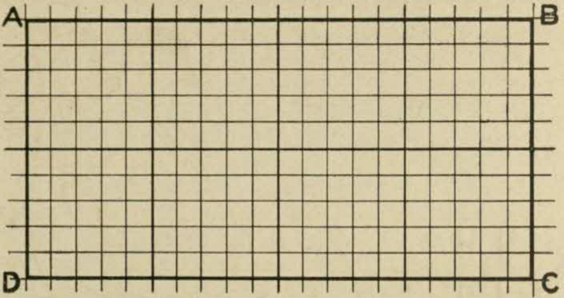
(*a*) Find the nett weight of the coal supplied.

(*b*) What is the cost of the coal?

11. (*a*) Make a copy of a delivery note, giving the following particulars: Gross weight: 2 tons 13 cwt. 1 qr.; Tare: 19 cwt. 1 qr.; Price: 57*s*. 6*d*. a ton; Description: Best Kitchen.

(*b*) Find the nett weight of this coal.

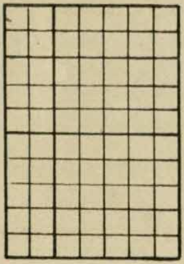
(*c*) What is the cost of this coal?



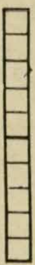
12. (*a*) How many small squares are there in the rectangle ABCD?

(*b*) During the year the amount of coal used in Great Britain is about 200 million tons. If this quantity is represented by the rectangle ABCD, how many tons are represented by each small square?

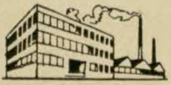
(*c*) Of these 200 million tons, 70 million tons are used in factories and 10 million tons by the railways. These amounts are shown by the rectangles below.

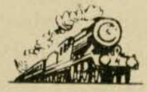


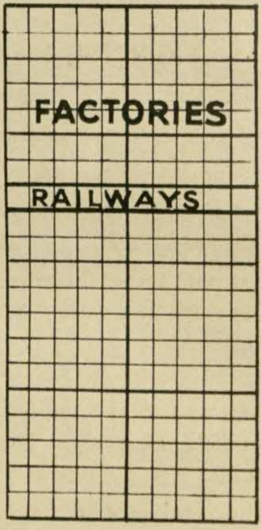
FACTORIES



RAILWAYS





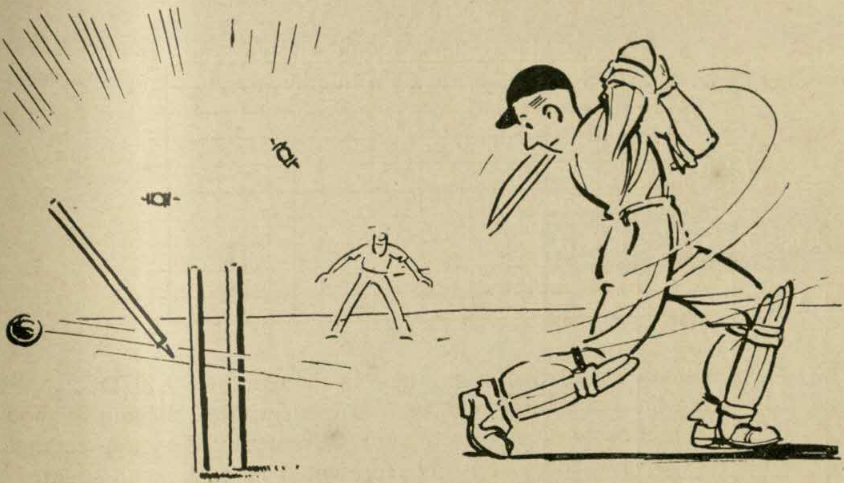


Draw similar rectangles to show the following amounts:

Gas manufacture, 20 million tons; Households, 40 million tons;
Coke manufacture, 20 million tons; Collieries, 20 million tons;
Manufacture of Electricity, 10 million tons.

(*d*) How many tons are used for other purposes? Draw a rectangle to represent this amount.

(*e*) Draw a rectangle, 2 in. by 1 in., and divide it into smaller rectangles to show the amount used under each of the " heads " in (*c*).



X. REVISION

EXERCISE 24. LOOKING BACKWARDS

First Glance

1. Find the cost of 1 cwt. of coal when 15½ cwt. cost £2 14*s*. 3*d*.
2. What is the cost of a score of toys at £9 6*s*. a gross?
3. If 16 lb. of sugar can be bought for 7*s*. 4*d*., how many pounds can be bought for 2*s*. 9*d*.?
4. A man is paid £6 6*s*. for a week of 42 working hours. How many hours did he work in a week when he received £5 5*s*.?

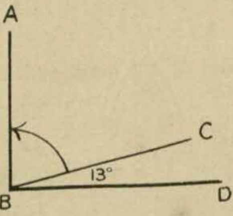
Second Glance

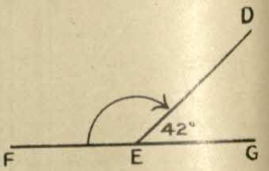
1. Make out and total a bill for Mrs. Bates, who bought the following from T. Hatfield, Dairyman, The Dingle, Parkhurst: 5 lb. of butter at 1*s*. 8*d*. a pound; 9 pt. of milk at 4½*d*. a pint; 2½ doz. eggs at 1*s*. 10*d*. a dozen.
2. Find the total cost of: 3½ lb. at 1*s*. 10*d*. per lb.; 2 lb. 10 oz. at 1*s*. 4*d*. per lb.; 12 oz. at 10*d*. per lb.; and 4 lb. 4 oz. at 11*d*. per lb.
3. Mrs. Roberts has ordered a load of coal from the Stafford Associated Collieries. Make out a copy of the delivery note which she will receive. Mention the following items:
   Gross weight: 1 ton 19 cwt. 1 qr.; Tare: 16 cwt. 3 qr.;
   Price: £3 16*s*. 8*d*. a ton; Description: Kitchen Nuts.
4. Find the cost of the coal delivered to Mrs. Roberts (Question 3).

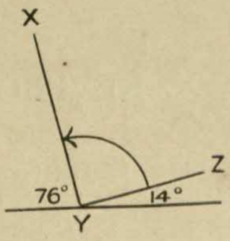
Third Glance

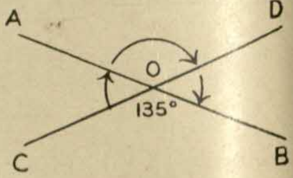
1. A grocer buys tea at £11 3*s.* 8*d.* a hundredweight and sells it at 7½*d.* a quarter-pound. Find his profit on a hundredweight of tea.
2. Make a copy of the table below. Now look at the diagrams and complete the second and third columns of the table.
   (*ABD is a right-angle.*)

ANGLE	SIZE	KIND
ABC		
DEF		
XYZ		
AOC		
AOD		
DOB		

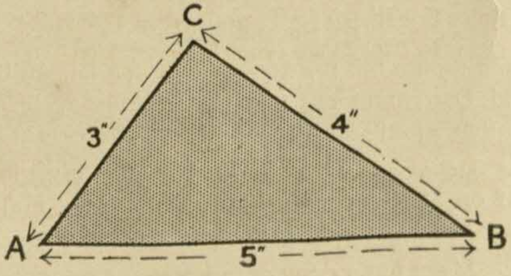








3. (*a*) On a base of 2½ in., draw an isosceles triangle having its sides 3¼ in. long.
   (*b*) Measure the height of your triangle.
4. (*a*) Draw a triangle ABC, making the base (AB) 5 in. long, the side (AC) 3 in. long, and the side (BC) 4 in. long.
   (*b*) Measure the angle ACB.



BASIC TRAINING SCH. HOOG.

EXERCISE 25. MECHANICAL SUMS

Set A. Simple Rules

1. Find the sum of: Three thousand, five hundred and thirty-seven; eight hundred and sixty-two; ten thousand and ten; seven thousand, three hundred and three; one thousand and nine.

2. 43,562 − 29,886

3. 675 × 76

4. 53,093 ÷ 32

5. 360,066 ÷ 37

Set B. Compound Rules

1. £3 13*s*. $7\frac{1}{2}$*d*. × 42

2. £705 16*s*. 11*d*. ÷ 26

3. 2 tons 11 cwt. 3 qr. × 17

4. 15 ml. 5 fur. 1 chn. ÷ 9

5. 5 st. $10\frac{1}{2}$ lb. + 3 st. $12\frac{3}{4}$ lb. + 5 st. $8\frac{1}{2}$ lb. + $13\frac{3}{4}$ lb.

6. 16 hr. 45 min. − 9 hr. 50 min.

7. 17 lb. 6 oz. − 8 lb. 12 oz.

8. 12 yd. 2 ft. 3 in. × 14

9. 306 gal. 1 qt. 1 pt. ÷ 19

Set C. Fractions

1. $5\frac{3}{8} + 2\frac{5}{6} + 1\frac{2}{3}$

2. $6\frac{2}{3} - 4\frac{7}{8}$

3. $3\frac{1}{2} \times 3\frac{3}{7}$

4. $3\frac{2}{3} \div 1\frac{2}{9}$

5. 35·07 + 100·1 + 8·28 + 66·06

6. 62·2 − 8·56

7. 7·08 × 57

8. 62·9 × 6·8

9. 89·6 ÷ 16

10. 150·1 ÷ 3·8

Set D. Reduction

1. Change £6 18*s*. 9*d*. to threepences.

2. Change 708 fourpences to pounds and shillings.

3. Change 2 cwt. 2 qr. 13 lb. to pounds.

4. Change 1,067 chn. to miles, furlongs, and chains.

5. How many times is 2 ft. 10 in. contained in 26 yd. 1 ft. 4 in.?

6. How many times is 1 hr. 10 min. contained in 23 hr. 20 min.?

7. How many times is 2 lb. 10 oz. contained in $1\frac{1}{2}$ cwt.?

8. How many times is 2 ft. $7\frac{1}{2}$ in. contained in 21 yd.?

Set E. Averages

Find the average of:

1. 256, 273, 199, 208, 255, 267

2. 15·07, 13·8, 16·63, 14·06

3. $2\frac{7}{8}$, $3\frac{3}{4}$, $1\frac{5}{8}$

4. 11*s*. $9\frac{1}{2}$*d*., 10*s*. 8*d*., 16*s*. 11*d*., 15*s*. $1\frac{1}{2}$*d*.

Set F. Areas

Find the area of:

1. Rectangle: 1 ft. 4 in. by $5\frac{1}{2}$ in. (Answer in sq.-in.)

2. Blackboard: 4 ft. 6 in. by 4 ft. 8 in. (Answer in sq.-ft.)

3. Carpet: $3\frac{3}{4}$ yd. by 2 yd. 1 ft. (Answer in sq.-yd.)

4. Rug: 72 in. by 54 in. (Answer in sq.-ft.)

XI. VULGAR FRACTIONS

EXERCISE 26. WRITING ONE QUANTITY AS THE FRACTION OF ANOTHER QUANTITY

1. (*a*) Write the following as fractions of 1*s*.:

1*d*., 2*d*., 3*d*., 4*d*., 6*d*., 8*d*., 9*d*., 10*d*.

(*b*) Write the following as fractions of £1:

1*s*., 2*s*., 2*s*. 6*d*., 4*s*., 5*s*., 7*s*. 6*d*., 10*s*., 12*s*. 6*d*.

2. (*a*) How many half-crowns are there in 12*s*. 6*d*.?

(*b*) How many half-crowns are there in £5?

(*c*) How many times is 12*s*. 6*d*. contained in £5?

(*d*) What part (or fraction) of £5 is 12*s*. 6*d*.?

What fraction of £5 is 12s. 6d.?

$$\frac{\text{12s. 6d.}}{\text{£5}} = \frac{\text{5 half-crowns}}{\text{40 half-crowns}} = \frac{5}{40} = \frac{1}{8}$$

What fraction of 1 ton is 6 cwt. 1 qr.?

$$\frac{\text{6 cwt. 1 qr.}}{\text{1 ton}} = \frac{\text{25 qr.}}{\text{80 qr.}} = \frac{5}{16}$$

In each of the above examples you will note that there are three steps to each sum :

(i) Write the sum as a fraction.

(ii) Bring the numerator and denominator to the same name.

(iii) Bring the fraction to its lowest terms.

3. Give the following as fractions of 1 yd.:

4 in., 9 in., 1 ft. 4 in., 2 ft. 3 in., 2 ft. 9 in.

4. What fractions of 1 cwt. are:

14 lb., 56 lb., 70 lb., 17 lb. 8 oz., 38 lb. 8 oz.?

5. What fractions of 1 ton are:

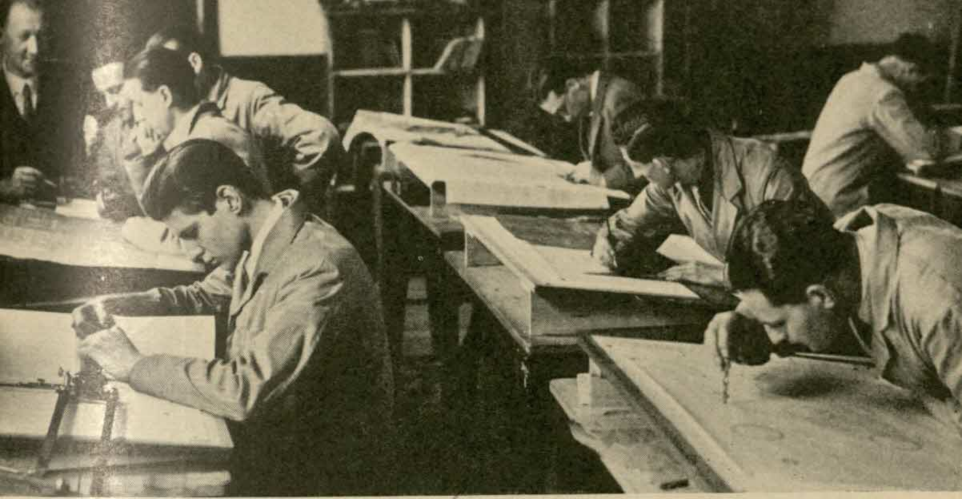
5 cwt., 10 cwt., 15 cwt., 2 cwt. 2 qr., 7 cwt. 2 qr.?

6. What fractions of 1 mile are:

220 yd., 440 yd., 880 yd., 7 fur., 1 fur. 2 ch., 4 fur. 5 chn.?

7. In the following examples, write the smaller quantity as a fraction of the larger quantity:

(*a*) 6*s*. 3*d*.; £1
(*b*) 5*s*. 4*d*.; £1
(*c*) 10*s*. 8*d*.; £1
(*d*) 13*s*. 6*d*.; £3
(*e*) 3*s*. 9*d*.; 10*s*.
(*f*) 3*s*.; 10*s*. 6*d*.
(*g*) 8*s*. 6*d*.; £2 11*s*.
(*h*) 16 chn.; 1 ml.
(*i*) 21 lb.; 3 qr.
(*j*) 3 cwt. 1 st.; 30 cwt.
(*k*) 3 fur. 5 chn.; 1 ml.
(*l*) 4 ft. 6 in.; 5 yd.

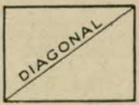


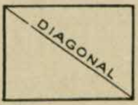
EXERCISE 27. DRAWING TO SCALE

LEARN

A line drawn across a rectangle from one angle to the opposite angle is called a DIAGONAL.

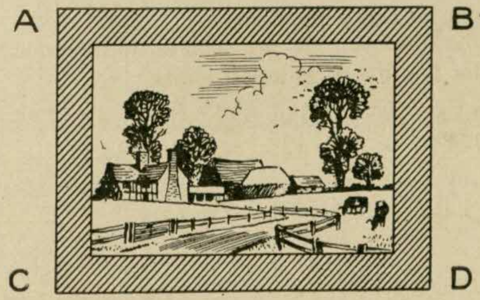
A rectangle has two DIAGONALS.





1. (*a*) Below is a drawing of a picture frame. What is the length of the side AB in the drawing?

   (*b*) The picture frame is actually 16 in. long. What length is represented by an inch on the drawing?



   (*c*) What fraction of the actual length of the frame is the length of the line AB?

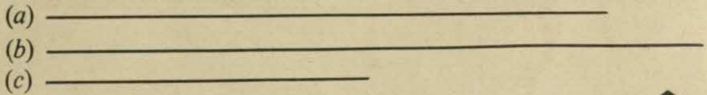
   (*d*) Measure the line AC. What is the actual width of the frame?

   (*e*) Measure the length from A to D. What is the actual length of the diagonal of the frame?

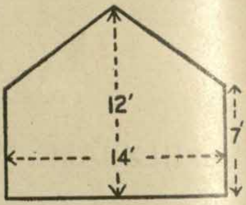
In the drawing, each inch stands for, or REPRESENTS, an ACTUAL length of 8 in. The picture frame has been drawn to a SCALE of 1 in. to 8 in.

2. If on a scale drawing 1 in. represents 8 in., what actual lengths will be represented by: (*a*) 3 in.; (*b*) 5 in.; (*c*) 7½ in.; (*d*) 3½ in.; and (*e*) 4½ in.?

3. The following lines are drawn to the scale of 1 in. to 1 ft. What is the actual length represented by each line?



4. The sketch shows the end of a garage. Draw it to a scale of ¼ in. to 1 ft.



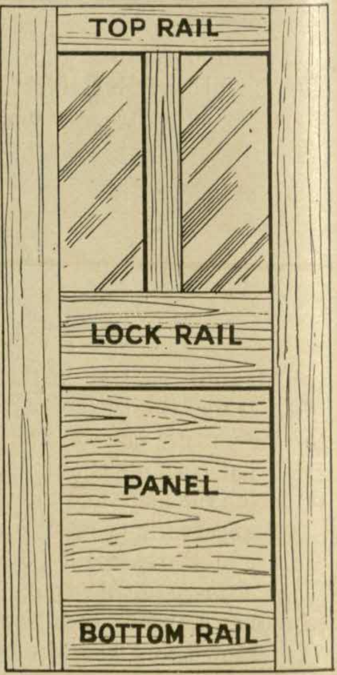
5. (*a*) If ½ in. represents 1 ft., then 1 in. will represent 2 ft., 1½ in. will represent 3 ft., and so on. Copy and complete the table below:

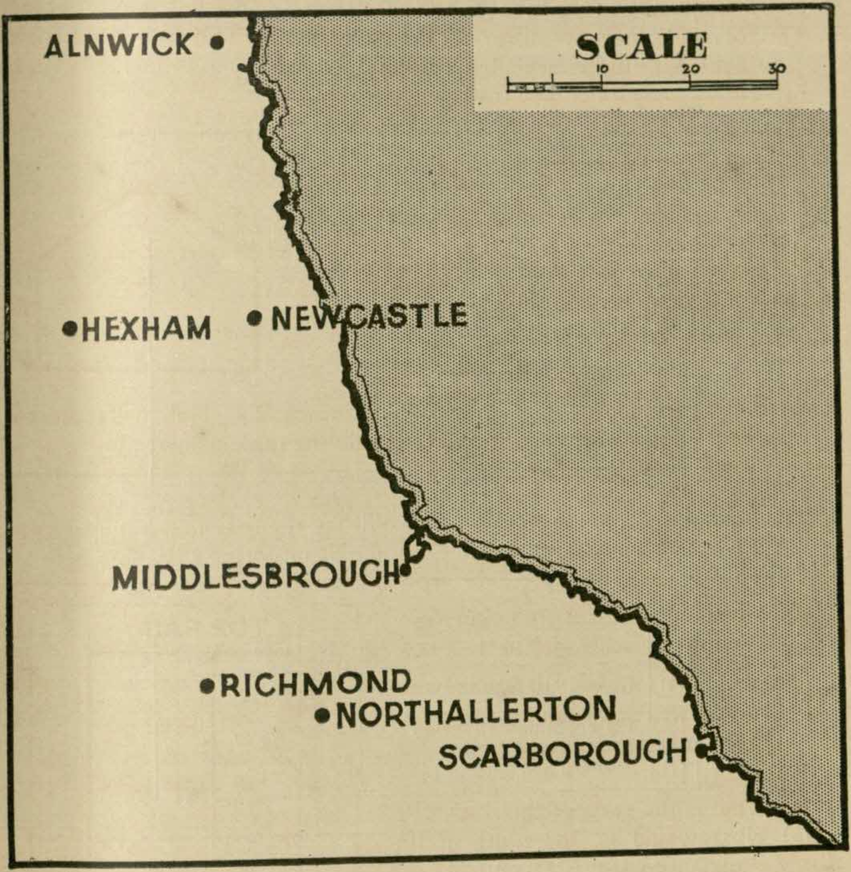
Length on drawing ..	½″	1″	1½″	3″	¼″	⅛″	$\frac{1}{16}''$
Actual length	1′	2′	3′				

(*b*) Make a drawing of your class-room door to a scale of ½ in. to 1 ft.

6. A room, 18 ft. long and 10 ft. 6 in. wide, is drawn to a scale, and the length of the room is represented by a line 3 in. long.
   (*a*) What is the scale of this drawing?
   (*b*) What would be the width of this scale drawing?

7. Here is a drawing of a door to the scale of: ½ in. to 1 ft. Measure the lines and find:
   (*a*) the actual length and breadth of the door;
   (*b*) the actual length and breadth of the bottom panel;
   (*c*) the length and breadth of each window;
   (*d*) the width of the top and of the bottom rails;
   (*e*) the width of the lock rail.





EXERCISE 28. USING A MAP

1. (*a*) Measure the line in the top right-hand corner of the map. What is the *scale* of the map?
   (*b*) How many miles are represented by:
   (i) $\frac{1}{2}$ in.; (ii) $\frac{1}{8}$ in.; (iii) 2 in.; (iv) $1\frac{3}{4}$ in.?
   (*c*) From the map, find the shortest distance between: (i) Middlesbrough and Scarborough; (ii) Newcastle and Alnwick; (iii) Northallerton and Hexham; (iv) Richmond and Scarborough. (*Measure each distance on the map.*)
   (*d*) An airman flew from Newcastle to Hexham and then on to Richmond. How many miles did he fly?
   (*e*) How many miles could he save on his return journey if, instead of returning by Hexham, he flew direct to Newcastle?

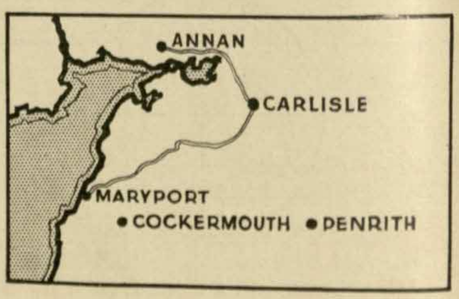
2. On a map drawn to a scale of ½ in. to 1 ml. the flying distance between King's Lynn and Peterborough is found to be 15 in., while the distance by road on the same map is 17 in. How many miles farther is it by car than by aeroplane between these towns?

3. In the table below, the actual flying distances between certain towns are given. Find what lengths, in inches, would represent these distances on a map having a scale of ¼ in. to 1 ml.

	Towns	Actual Distance
(a)	**Hull to Liverpool**	**112 ml.**
(b)	**Leeds to Nottingham**	**64 ml.**
(c)	**Bristol to Plymouth**	**104 ml.**
(d)	**Gloucester to Southampton**	**80 ml.**
(e)	**London to Brighton**	**48 ml.**

4. The following distances were measured along the roads on a map having a scale of ½ in. to 1 ml. Find the actual motoring distances between the towns:

	Towns	Distance on Map
(a)	**Oxford and Banbury**	**11½ in.**
(b)	**Plymouth and Tavistock**	**7½ in.**
(c)	**Stafford and Lichfield**	**8½ in.**



5. (*a*) Measure the shortest distance from Maryport to Carlisle, in inches and tenths of inches.
   (*b*) The actual distance between these two towns is 25 ml. What is the scale of this map?
   (*c*) What is the distance, *as the crow flies* (i.e. the straight distance), from Cockermouth to Penrith?
   (*d*) What is the shortest distance from Maryport to Annan?
   (*e*) What is the approximate (or rough) distance between these two towns by road through Carlisle? The road is marked on the map, and should be measured by means of a piece of cotton.

EXERCISE 29. PROBLEMS ON FRACTIONS

1. (*a*) A woman, who receives £2 16*s*. from her husband each week, finds that she spends on an average 24*s*. 6*d*. on food. What fraction of her weekly allowance for housekeeping is spent on food?
   (*b*) What fraction of her allowance is spent on rent if this amounts to 10*s*. 6*d*. a week?

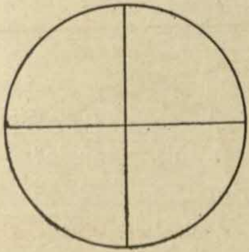
2. During his morning round, a milkman delivers 26 gal. of milk. What fraction of this is supplied to a hotel taking $3\frac{1}{4}$ gal.?

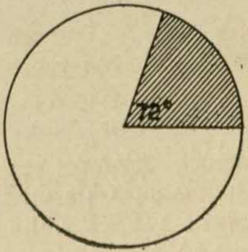
3. A baker uses 5 st. of flour to make $122\frac{1}{2}$ lb. of dough. What fraction of this dough is flour?

4. A joint of meat, weighing $7\frac{1}{2}$ lb., was found to contain 2 lb. 4 oz. of bone. What fraction of the joint was bone?

5. A grocer bought sugar at 28*s*. a hundredweight and sold it at 4*d*. a pound.
   (*a*) What was the cost price of a pound of this sugar to the grocer?
   (*b*) How much did the grocer gain on each pound?
   (*c*) Write this gain as a fraction of his cost price.
   (*d*) Write this gain as a fraction of his selling price.
   (*e*) How much will this grocer receive for the hundredweight of sugar?
   (*f*) How much did he gain by selling this hundredweight of sugar?
   (*g*) Write this gain as a fraction of his cost price (28*s*.).
   (*h*) Write this gain as a fraction of the selling price found in (*e*) above.

6. (*a*) How many degrees are there in a circle?
   (*b*) What fraction of a circle is an angle of 72°?





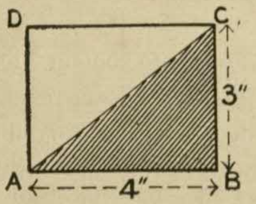
7. After cutting out a circle from a piece of tin-plate, 4″ square, it was found that the waste material had an area of $3\frac{3}{7}$ sq. in. What fraction of the square is the circle?

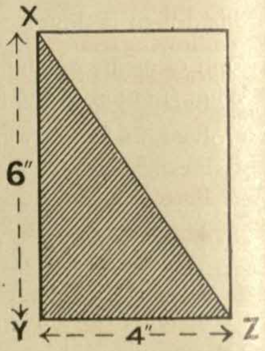
8. If the area of the largest circle that can be cut from a square is $\frac{11}{14}$ of the area of the square, what is the area of the circle cut from a 14″ square?

XII. AREA

EXERCISE 30. THE AREA OF A TRIANGLE

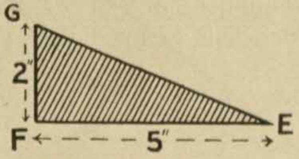
1. (*a*) On a sheet of paper, draw and cut out a rectangle ABCD, 4 in. long and 3 in. wide. What is the area of the rectangle?
   (*b*) Draw AC, and cut along this line. Are the two triangles equal? Place one on the other and test.
   (*c*) What is the area of one of these triangles?



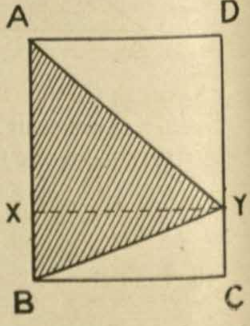


2. (*a*) What is the area of a rectangle 6 in. long and 4 in. broad?
   (*b*) What is the area of the triangle XYZ shown in the figure?

3. What is the area of the triangle EFG, if EF is 5 in. and FG is 2 in.?



4. (*a*) On a sheet of paper, draw and cut out a rectangle ABCD, 5 in. long and 4 in. wide. What is the area of this rectangle?
   (*b*) Take any point Y on the line CD, and draw the lines YA, YB and YX. YX is at right angles to AB. Cut along these three lines, and test if the triangle AYX is equal to the triangle AYD. Test if the triangle BYX is equal to the triangle BYC.
   (*c*) What is the area of the triangle ABY?

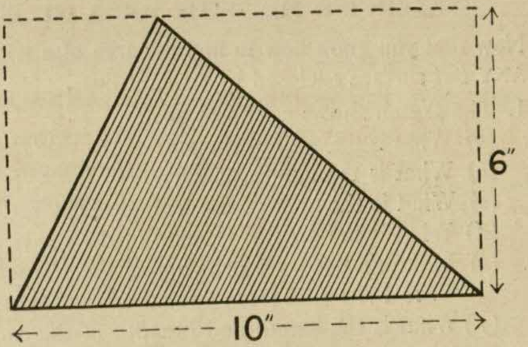


From the above examples, you will see that the AREA OF A TRIANGLE may be considered as HALF THE AREA OF A RECTANGLE.

5. The figure shows a triangle with a base of 10 in. and 6 in. high, drawn within a rectangle.

(*a*) What is the area of the rectangle?

(*b*) What is the area of the triangle?



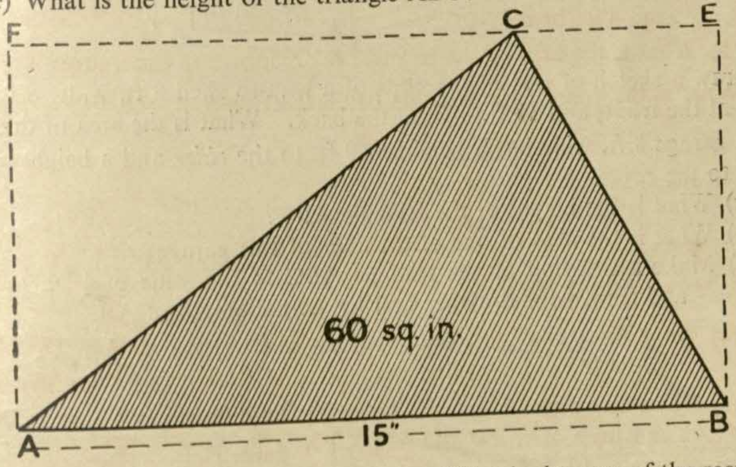
6. Find the areas of the following triangles. Draw sketches.

(*a*)	Base, 15 in.;	Height, 10 in.	(Answer in sq.-in.).
(*b*)	Base, 26 in.;	Height, 12 in.	(Answer in sq.-in.).
(*c*)	Base, $3\frac{1}{2}$ ft;	Height, 8 ft.	(Answer in sq.-ft.).
(*d*)	Base, 2 ft. 8 in.;	Height, 2 ft. 3 in.	(Answer in sq.-ft.).

7. (*a*) The triangle ABC below has an area of 60 sq.-in. What is the area of the rectangle ABEF?

(*b*) AB is 15 in. long; what is the height of the rectangle?

(*c*) What is the height of the triangle ABC?



8. (*a*) A triangle has an area of 36 sq.-in. What is the area of the rectangle enclosing the triangle *as in the last question*?

(*b*) If this rectangle has a height of 6 in., what is the length of the base of the triangle? Draw a sketch.

9. Find the length of the base of a triangle having an area of 40 sq.-in. and a height of 8 in. Draw a sketch.

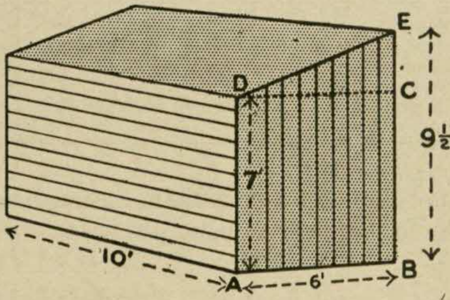
10. Find the height of a triangle having an area of 6 sq.-ft. and a base of 2 ft. 3 in. Draw a sketch.

EXERCISE 31. THE AREA OF IRREGULAR SHAPES

Now that you know how to find the area of a triangle, you can find the area of ANY flat surface enclosed by straight lines.

1. The sketch shows a lean-to shed.

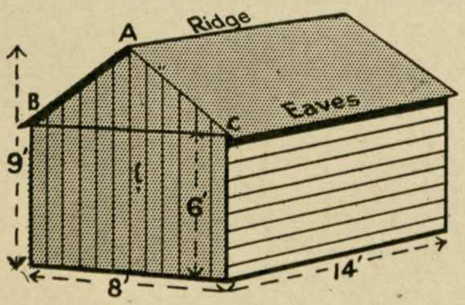
(*a*) What is the area of the part of the side shown by the rectangle ABCD?
(*b*) What is the length of CE?
(*c*) What is the area of the triangle DEC?
(*d*) What is the area of the end of the shed?
(*e*) Make an accurate drawing of the triangle DEC, to the scale of $\frac{1}{2}$ *in. to* 1 *ft.*; and from your drawing find the actual length of DE.
(*f*) What is the length and breadth of the roof of this shed?
(*g*) What is the area of the roof?

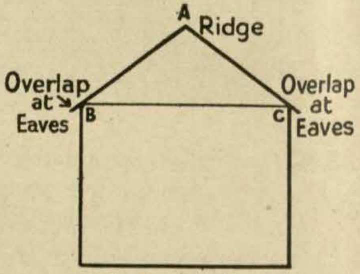


2. Draw a sketch of one of the ends of a lean-to shed 8 ft. wide, 8 ft. high at the front, and 11 ft. high at the back. What is the area of this end?

3. A garage 8 ft. wide has a height of 9 ft. to the *ridge* and a height of 6 ft. to the *eaves*.

(*a*) What is the height of the triangle ABC?
(*b*) What is the area of one of the ends of this garage?
(*c*) Make a drawing of the triangle ABC to the scale of $\frac{1}{2}$ *in. to* 1 *ft.*; and from your drawing find the actual length of AB.





A Gable End

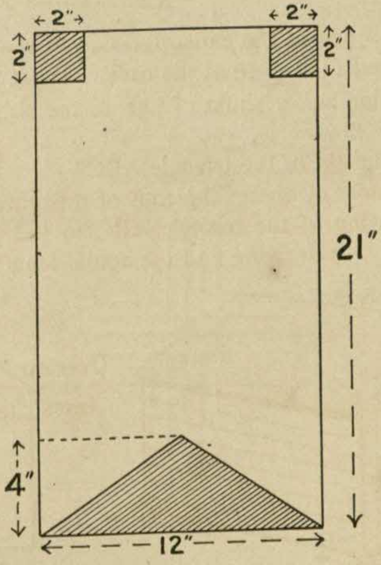
(*d*) Find the area of the roof of the garage, if there is a 3-in. overlap at the eaves.

4. Draw a sketch of a *gable end* of a garage 12 ft. wide, 6 ft. 6 in. high at the sides, and 10 ft. high to the ridge. What is the area of this end?

5. From the measurements below, find the area of one of the gable ends of each building. Draw a sketch in each case.

Building	**Width**	**Height**	
		Ridge	**Eaves**
Doll's house	**7½ in.**	**10 in.**	**6 in.**
Poultry house	**10½ ft.**	**8 ft.**	**6 ft.**
Garage	**11 ft.**	**9 ft. 6 in.**	**7 ft. 6 in.**
Workshop	**20 ft.**	**12 ft. 3 in.**	**8 ft. 9 in.**
Dwelling-house	**34 ft.**	**32 ft.**	**24 ft.**

6. A boy bought a sheet of plywood, 12 in. wide and 21 in. long, and cut it as shown in the sketch to make a panel for his wireless set.

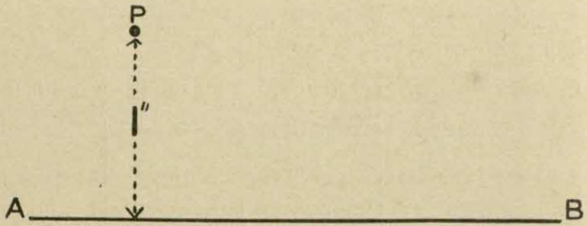


(*a*) What was the area of the sheet of plywood?
(*b*) What was the total area of the parts cut off as waste?
(*c*) What was the area of the plywood in the panel?

XIII. MORE ABOUT TRIANGLES

SOMETHING TO READ: ANOTHER MOVING POINT

Draw any straight line AB and mark a point P, 1 inch above the line. Now suppose this point to move so that it is always 1 inch above the line; that is, it must not get nearer to, nor farther from, the line AB. Can you draw its path? Try.



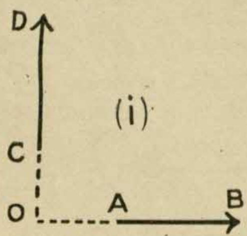
Look at the four drawings below.

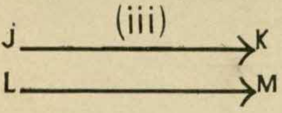
In (i), the line AB is pointing east and the line CD is pointing north. If they are lengthened, they will meet at O and the angle DOB will be a right-angle (90°).

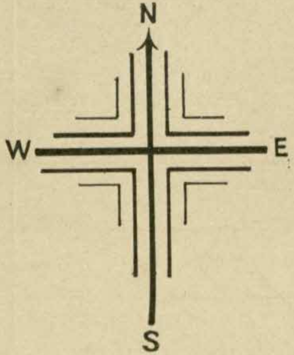
In (ii), EF is pointing east and GH is pointing north-east. Will these lines meet if lengthened? If so, what is the size of the angle?

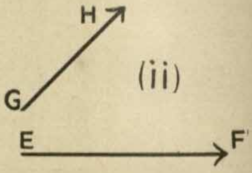
In (iii), both lines are pointing east. Will they meet if lengthened?

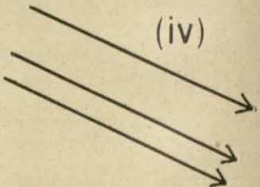
In (iv), the three lines are pointing in the same direction. Will any of these lines meet if lengthened?





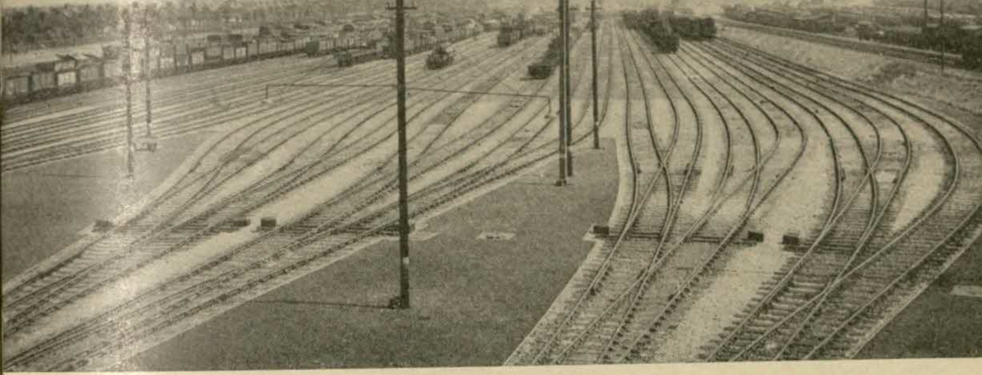






Lines which point in the same direction are called **parallel lines.** The line LM is parallel to JK; and the line JK is parallel to the line LM.

You will also see that two parallel lines do not meet when lengthened and that they always keep the same distance apart.

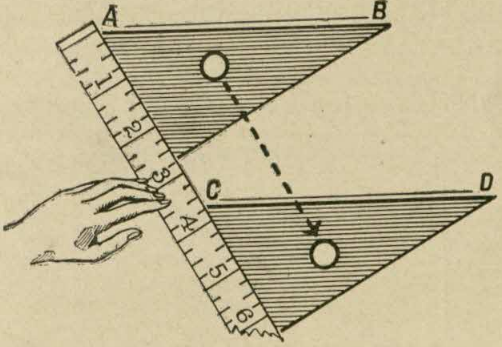


Railway lines are parallel lines; the distance between the rails is equal to the distance between the wheels of the engine and carriages. The distance between the rails is called the **gauge** and, in this country, is 4 ft. 8½ in.

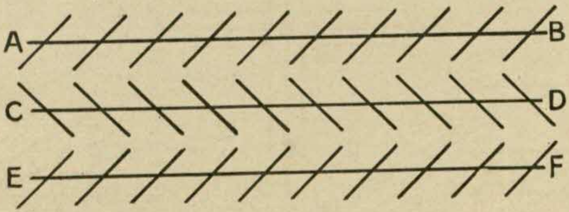
HOW TO DRAW PARALLEL LINES

Place your ruler and set-square on your paper as shown. Draw a line along the top edge of the set-square (AB). Without moving the ruler, slide the set-square along the ruler, as shown by the dotted line, and draw another line along the top edge of the set-square (CD).

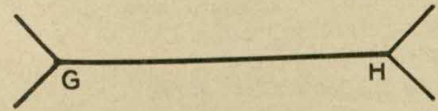
AB and CD are parallel lines.

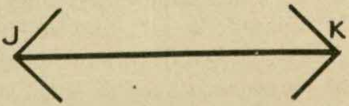


Are the lines AB, CD and EF parallel? Test with your ruler and set-square.



Which is the longer line, GH or JK? Test with your ruler.

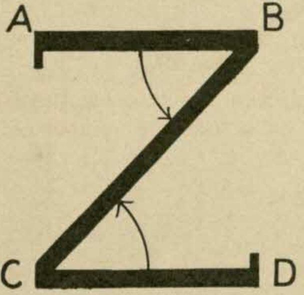


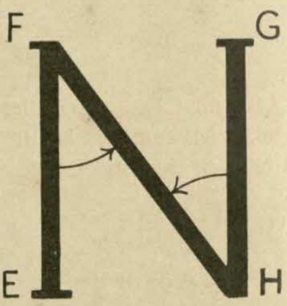


EXERCISE 32. THE LETTERS N AND Z

1. Each of the letters N and Z consists of two parallel lines joined by a slanting line.

   (*a*) Measure the angles ABC and BCD of the letter Z with your protractor. What do you find?





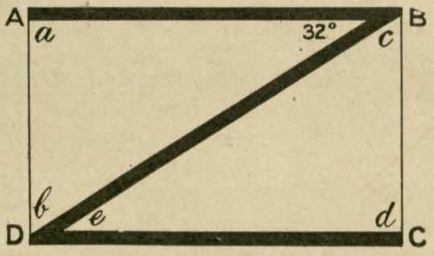
   (*b*) Measure the angles EFH and GHF of the letter N. What do you find?

   (*c*) Draw another letter Z and measure the two angles.

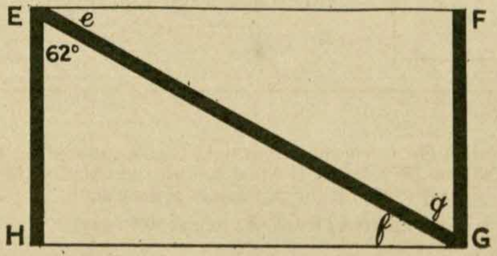
   (*d*) Draw a letter N and measure its angles.

2. (*a*) Look at the rectangle ABCD. The angle, ABD, is 32°. What is the size of the angle *e*?

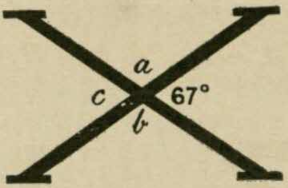
   (*b*) How many degrees are there in each of the angles: *a*, *b*, *c*, and *d* ?



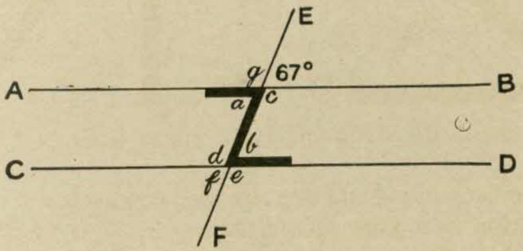
3. Look at the rectangle EFGH. What is the size of each of the angles *e* *f*, and *g*?



4. (*a*) How many degrees are there in each of the angles shown in the letter X?



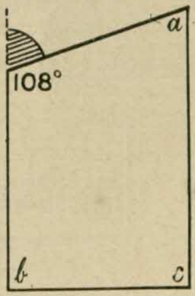
(*b*) AB and CD are parallel lines. EF is a line crossing these parallel lines. Make a similar drawing and on it state the number of degrees in each of the angles *a*, *b*, *c*, *d*, *e*, *f*, and *g*.

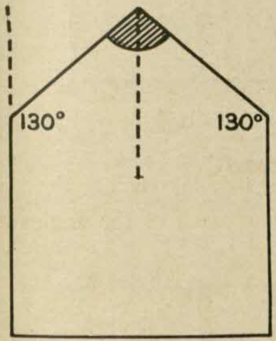


5. (*a*) Look at the sketch of the end of a lean-to shed. What is the size of the shaded angle?

(*b*) What is the size of the angle *a*?

(*c*) What is the sum of the four angles inside this figure?





6. (*a*) Sketch this gable end and find the number of degrees in the shaded ridge angle. (*The dotted lines will help you.*)

(*b*) What is the sum of the five angles inside this figure?

LEARN

When a straight line meets another straight line, the sum of the two ADJACENT (or ⌐) angles is equal to two right-angles (180°).

OPPOSITE (or X) angles are equal.

ALTERNATE (or Z) angles are equal.

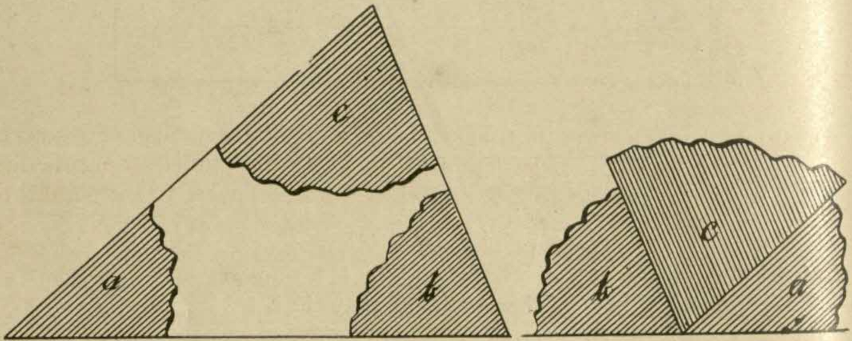
EXERCISE 33. THE SUM OF THE ANGLES OF A TRIANGLE

1. Measure the three angles of your set-square. What is the sum or total of these angles?

2. Draw any triangle and measure its three angles with your protractor. What is the sum of these angles?

3. Draw an equilateral, an isosceles, and a scalene triangle. Measure the three angles in each of these triangles. What is the sum of the three angles in each triangle?

4. Draw any triangle on a sheet of paper and cut it out. *Tear* off the three corners and place them side by side as shown. What is the sum of the three angles of this triangle?



LEARN

The sum of the THREE ANGLES OF ANY TRIANGLE is equal to 180° (two right-angles).

5. If two angles of a triangle are 55° and 75°, what is the size of the third angle?

6. (*a*) If a triangle has three equal angles, how many degrees are there in each?

(*b*) What kind of a triangle would this be?

7. (*a*) One angle of a triangle is 52° and its other two angles are equal. Find the number of degrees in each of the equal angles.

(*b*) What kind of triangle is this?

8. An isosceles triangle has base angles of 70°. What is the size of the remaining angle of this triangle?

9. Find the size of the third angle of a triangle if two of its angles are 90° and 35°.

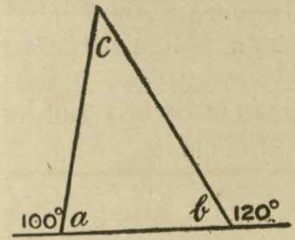
This triangle is called a **right-angled triangle.** Can you give the reason for this name?

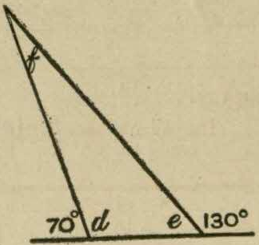
10. A right-angled triangle has one of its angles 65°. What is the size of each of the other angles?

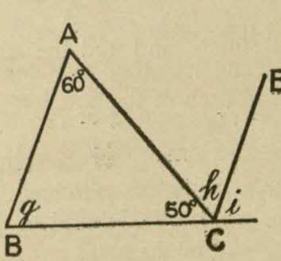
11. Copy and complete the table below. The first example is done for you.

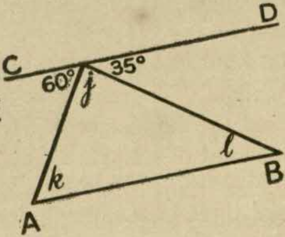
Angles of Triangle			**Kind of Triangle**
65°	35°	80°	Scalene
	90°	36°	
	72°	36°	
			Equilateral
	63°	27°	
	102°	55°	

12. (*a*) Make sketches of the triangles below and give the number of degrees in each of the angles lettered *a* to *l*. In the third drawing the line CE is parallel to AB, and in the fourth drawing CD is parallel to AB.









(*b*) Find the sum of the three angles of each triangle.

XIV. FRACTIONS AND THEIR USES

EXERCISE 34. THE WRITING OF FRACTIONS: VULGAR AND DECIMAL

1. Write the following vulgar fractions as decimal fractions:

(*a*) $\frac{3}{10}$ (*b*) $\frac{7}{10}$ (*c*) $\frac{1}{5}$ (*d*) $\frac{4}{5}$ (*e*) $\frac{1}{2}$ (*f*) $\frac{3}{4}$

2. Write the following decimal fractions as vulgar fractions:

(*a*) 0·1 (*b*) 0·4 (*c*) 0·9 (*d*) 0·25 (*e*) 0·12 (*f*) 0·35

3. Write the following as decimal fractions:

(*a*) $\frac{9}{16}$ (*b*) $\frac{17}{20}$ (*c*) $\frac{13}{25}$ (*d*) $\frac{27}{40}$ (*e*) $\frac{39}{50}$ (*f*) $\frac{33}{80}$

4. (*a*) Write to the nearest sixpence: £3 16*s*. 8*d*.; £1 12*s*. 2*d*.; £4 9*s*. 11*d*.

(*b*) Write to the nearest shilling: 17*s*. 9*d*.; £1 3*s*. 5*d*.; £2 16*s*. 10*d*.

(*c*) Write to the nearest ten: 24; 36; 372; 5,689.

(*d*) Write to the nearest tenth: 0·48; 1·63; 3·56; 6·483.

$$\frac{13}{15} = \frac{2{\cdot}6}{3} = 0{\cdot}8666\ldots = 0{\cdot}867 \text{ to the nearest third place of decimals.}$$
$$= 0{\cdot}87 \text{ to the nearest second place of decimals.}$$
$$= 0{\cdot}9 \text{ to the nearest first place of decimals.}$$

5. Change the following into decimal fractions. Work to three places of decimals, and give your answers to the nearest *hundredth*:

(*a*) $\frac{7}{12}$ (*b*) $\frac{13}{18}$ (*c*) $\frac{15}{22}$ (*d*) $\frac{17}{24}$ (*e*) $\frac{23}{30}$
(*f*) $\frac{11}{14}$ (*g*) $\frac{5}{13}$ (*h*) $\frac{26}{31}$ (*i*) $\frac{37}{46}$ (*j*) $\frac{17}{52}$

6. (*a*) Find the missing numerators in the following:

$\frac{1}{2} = \frac{\ }{12}$; $\frac{3}{4} = \frac{\ }{12}$; $\frac{2}{5} = \frac{\ }{10}$; $\frac{3}{8} = \frac{\ }{16}$; $\frac{8}{15} = \frac{\ }{60}$; $\frac{7}{12} = \frac{\ }{60}$

(*b*) Which is the larger fraction, $\frac{8}{15}$ or $\frac{7}{12}$?

(*c*) Change $\frac{8}{15}$ and $\frac{7}{12}$ to decimal fractions.

(*d*) Which is the larger of these decimal fractions? Does this agree with your answer to (*b*)?

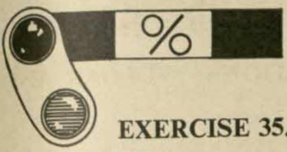
7. Change the following fractions to decimals, and find the larger fraction in each pair:

(*a*) $\frac{1}{4}$ or $\frac{3}{8}$ (*b*) $\frac{3}{8}$ or $\frac{5}{16}$ (*c*) $\frac{9}{16}$ or $\frac{7}{12}$ (*d*) $\frac{3}{4}$ or $\frac{9}{10}$ (*e*) $\frac{2}{3}$ or $\frac{7}{8}$

8. (*a*) Change the following to decimal fractions: $\frac{35}{48}$ $\frac{53}{75}$ $\frac{23}{30}$

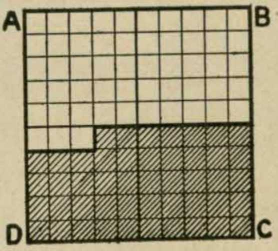
(*b*) Jack had three tests in arithmetic. In the first, he had 35 marks out of 48; in the second, 53 marks out of 75; and in the third, 23 marks out of 30. In which test did he do best?

9. At the end of the term, Margaret obtained 62 marks out of 80, and Barbara received 65 out of 90. Which girl did the better?



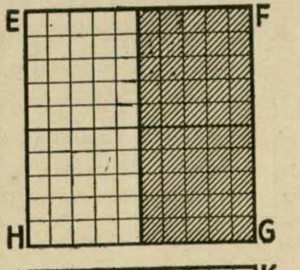
EXERCISE 35. A NEW SIGN—" PER CENT."

1. (*a*) How many years are there in a **century**?
   (*b*) " Brown requires 18 runs for another *century*." How many runs has Brown made in this innings?
2. Any fraction with 100 as its denominator, such as $\frac{9}{100}$, may be written thus: 9/100 or 9%. Write the following as vulgar fractions:
   (*a*) 19% (*b*) 23% (*c*) 77%
   (*d*) 91% (*e*) 53%
3. Look at the square ABCD.
   (*a*) How many squares are there in ABCD?
   (*b*) How many of these small squares are shaded?
   (*c*) What fraction of ABCD is shaded? Use the new sign (%) in your answer.

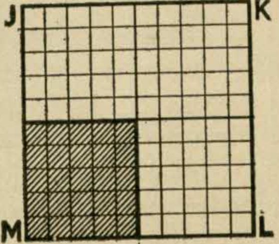


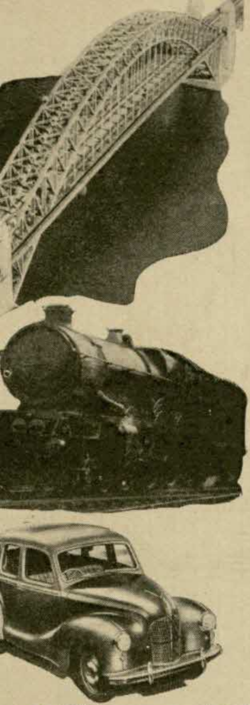
This new sign (%) is called the PERCENTAGE SIGN, and is used in place of the words PER HUNDRED or PER CENT.

$\frac{47}{100}$ may be written as 47%, and is read as FORTY-SEVEN PER CENT., or FORTY-SEVEN PER HUNDRED. In Question 3, 47% (FORTY-SEVEN PER CENT.) of the square is shaded.



4. Look at the square EFGH.
   (*a*) What **percentage** of this square is shaded?
   (*b*) What decimal fraction of the square is shaded?
   (*c*) What vulgar fraction of the square is shaded?
5. Look at the square JKLM.
   What fraction of the square is shaded?
   Give your answer:
   (*a*) as a percentage;
   (*b*) as a decimal fraction;
   (*c*) as a vulgar fraction.
6. Write the fraction ¾ in two other ways.





EXERCISE 36.

100% BRITISH MANUFACTURE

16% (16 per cent. or 16 per hundred) $= \frac{16}{100} = \frac{4}{25}$

$3\frac{1}{3}$% ($3\frac{1}{3}$ per cent.) $= \frac{3\frac{1}{3}}{100} = \frac{10}{300} = \frac{1}{30}$

The numerator and denominator of the fraction $\frac{3\frac{1}{3}}{100}$ have been multiplied by 3.

1. Write as vulgar fractions in their lowest terms:
   (*a*) 35% (*b*) 28% (*c*) 74% (*d*) $8\frac{1}{3}$%

$37\frac{1}{2}\% = \frac{37{\cdot}5}{100} = 0{\cdot}375$

2. Write as decimal fractions: (*a*) 32% (*b*) 76% (*c*) $7\frac{1}{2}$% (*d*) $8\frac{1}{3}$%
3. (*a*) On squared paper, draw a square containing 100 small squares. Shade $12\frac{1}{2}$ of these small squares. Now shade another $12\frac{1}{2}$ squares. Continue in this way until the large square is completely shaded.
   (*b*) What vulgar fraction is equal to $12\frac{1}{2}$%?
4. (*a*) On squared paper, draw a square containing 100 small squares. Shade $33\frac{1}{3}$ of these small squares. Now shade another $33\frac{1}{3}$ squares.
   (*b*) What vulgar fraction is equal to $33\frac{1}{3}$%?
5. In the table below fill in the empty columns and *memorise* the results.

Percentage	Vulgar fraction	Decimal fraction	Percentage	Vulgar fraction	Decimal fraction
10%			25%		
5%			$12\frac{1}{2}$%		
$2\frac{1}{2}$%			75%		
20%			$33\frac{1}{3}$%		0·333
50%			$66\frac{2}{3}$%		0·666

6. (*a*) On squared paper, draw three squares each containing 100 small squares. Shade 36% of the first square; 87% of the second square; and 100% of the third square.
   (*b*) What is meant by 100% **British manufacture?**

XV. REVISION

EXERCISE 37. LOOKING BACKWARDS

First Glance

1. A man who earns £4 4*s*. each week lives in a house rented at 18*s*. 8*d*. a week. What fraction of his income is spent on rent?

2. What will 6$\frac{5}{8}$ yd. of fencing cost at 15*s*. 4*d*. a yard?

3. A plan is drawn to the scale of 1$\frac{1}{2}$ in. to 1 ft.
    (*a*) What lengths on this plan will represent actual lengths of:
        (i) 1 ft. 4 in.; (ii) 2 ft. 4 in.; (iii) 3 ft. 6 in.; (iv) 8 in.?
    (*b*) What actual lengths are represented by the following measurements on this plan :
        (i) 2$\frac{1}{2}$ in.; (ii) 1$\frac{3}{4}$ in.; (iii) 1$\frac{7}{8}$ in.; (iv) 4 in.?

4. The actual flying distance from Liverpool to Southampton is 170 ml. What would be the distance between these towns on a map drawn to the scale of 1 in. to 34 ml.?

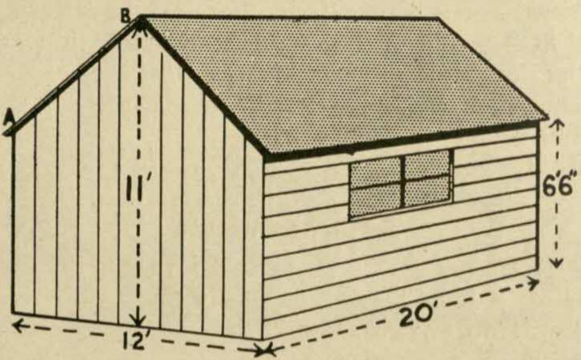
Second Glance

1. Find the area of a triangle having a base of 3 ft. 9 in. and a height of 4 ft. 8 in.

2. Draw an equilateral triangle with 3-in. sides. Measure its height and find its area.

3. (*a*) What is the area of one of the gable ends of the garage shown in the sketch?

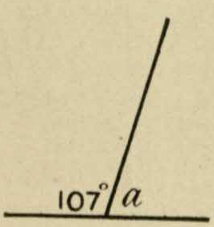
(*b*) Draw the gable end to the scale of $\frac{1}{4}$ in. to 1 ft. What is the actual length of AB?

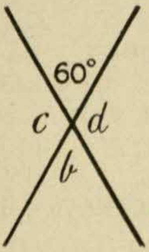


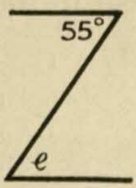
(*c*) What is the area of the roof?

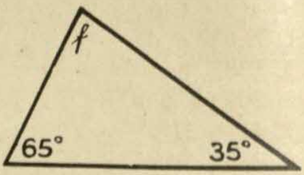
(*d*) How many square feet of wood would be required to make this garage? Neglect the floor and give your answer to the nearest 100 sq.-ft.

4. Give the number of degrees in each of the angles *a*, *b*, *c*, *d*, *e*, *f*.









Third Glance

1. (*a*) Find the larger of the fractions $\frac{13}{21}$ and $\frac{17}{27}$ by changing them into decimal fractions.

(*b*) Write 36% as a vulgar fraction, and as a decimal fraction.

2. Find the cost of 7 tons 16 cwt. at £1 16*s*. 8*d*. a ton.

3. What is the cost of $3\frac{3}{4}$ yd. of material when $1\frac{3}{4}$ yd. cost 14*s*.?

4. Cleaning-cloth may be bought at 1*s*. a roll of $12\frac{1}{2}$ yd., or at 3*s*. 3*d*. a roll of 50 yd. How much would the owner of a garage save in a year by buying the larger instead of the smaller rolls, if he uses 1,000 yd. in that time?

EXERCISE 38. MECHANICAL SUMS

Set A. Addition

1. 2,756 + 3,548 + 199 + 3,979 + 3,707 + 10,876
2. £35 16*s*. 7$\frac{1}{2}$*d*. + £17 19*s*. 11*d*. + £16 12*s*. 9$\frac{1}{2}$*d*.
3. 5 tons 13 cwt. 2 qr. + 6 tons 10 cwt. 3 qr. + 8 tons 15 cwt. 1 qr.
4. 11 st. 10$\frac{1}{2}$ lb. + 9 st. 5$\frac{3}{4}$ lb. + 6 st. 6$\frac{1}{2}$ lb. + 3 st. 3$\frac{3}{4}$ lb.
5. 15 gal. 2 qt. 1 pt. + 10 gal. 3 qt. + 16 gal. 1 pt.
6. 3 fur. 2 chn. + 6 fur. 5 chn. + 3 ml. 3 fur. 8 chn.
7. 15·3 + 8·07 + 130·6 + 36·89 + 28·05
8. $2\frac{2}{3} + 3\frac{3}{4} + 1\frac{5}{6}$

Set B. Subtraction

1. 30,872 − 17,958
2. £5 10*s*. 7*d* − £2 18*s*. 10$\frac{1}{2}$*d*.
3. 23 lb. 11$\frac{3}{4}$ oz. − 16 lb. 13$\frac{1}{2}$ oz.
4. 19 chn. 9 yd. − 13 chn. 19 yd.
5. 16 cwt. 1 qr. 17 lb. − 9 cwt. 3 qr. 22 lb.
6. 7 yd. 1 ft. 3 in. − 3 yd. 2 ft. 11 in.
7. 106·2 − 98·98
8. $10\frac{2}{3} - 6\frac{5}{6}$

Set C. Multiplication

1. 3,807 × 76
2. 13*s*. 5$\frac{3}{4}$*d*. × 23
3. £8 16*s*. 6$\frac{1}{2}$*d*. × 47
4. 7 gal. 3 qt. 1 pt. × 67
5. 7 ft. 11$\frac{3}{4}$ in. × 53
6. $7\frac{1}{5} \times 2\frac{1}{12}$
7. 4·7 × 8·6
8. 50·2 × 3·7

Set D. Division

1. 39,652 ÷ 18
2. 70,056 ÷ 37
3. £387 16*s*. 10*d*. ÷ 11
4. £907 13*s*. 9*d*. ÷ 47
5. 309 yd. 6 in. ÷ 53
6. 23 st. 10$\frac{1}{2}$ lb. ÷ 7
7. $1\frac{1}{8} \div 2\frac{1}{4}$
8. 72·8 ÷ 16
9. 3·6 ÷ 0·06
10. 506·76 ÷ 12·3

Set E. Fractions

1. How many times is 7*s*. 3*d*. contained in £5 1*s*. 6*d*.?
2. How many times is 15*s*. 6*d*. contained in £12 8*s*.?
3. How many times is 1 qt. 1 pt. contained in 7$\frac{1}{2}$ gal.?
4. How many times is 44 yd. contained in 6 fur. 4 ch.?
5. What fraction of 4*s*. 6*d*. is 2*s*. 6*d*.?
6. What fraction of 4 cwt. is 1 cwt. 1 qr.?
7. What fraction of £1 10*s*. is 16*s*. 8*d*.?
8. What fraction of 22$\frac{1}{2}$ hr. is 90 min.?
9. What fraction of 7 lb. is 3 lb. 15 oz.?
10. What fraction of 15 yd. is 1 ft. 10$\frac{1}{2}$ in.?

Set F. Averages

Find the average of:

1. 58, 63, 71, 62, 70, 59, 57, 66, 61.
2. 12*s*. 3½*d*., 11*s*. 10*d*., 10*s*. 9¾*d*., 11*s*. 6½*d*., 10*s*. 8*d*., 12*s*. 1¼*d*.
3. 118 ft. 9 in., 120 ft. 6 in., 116 ft. 9 in.
4. 23½, 16⅜, 18⅝.
5. 0·03, 0·16, 0·19, 0·09, 0·15, 0·1.

Set G. Areas

1. Find the area of a rectangle 1 ft. 2 in. long and 7½ in. wide.
2. Find the area of a floor 22½ ft. long and 14 ft. 8 in. wide.
3. Find the area of a triangle having a base of 5½ in. and a height of 4 in.
4. Find the area of a gable end having a width of 12 ft., a height to the eaves of 7¼ ft., and a height to the ridge of 9¾ ft.
5. Find the area of a gable end having a width of 10 ft., a height to the eaves of 6½ ft., and a height to the ridge of 8½ ft.

LEARN

$ab = a \times b$; $2a = 2 \times a$

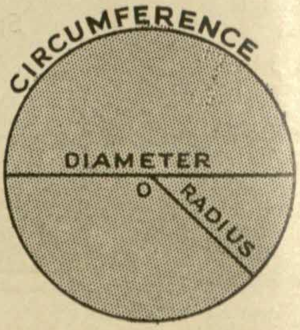
$abc = a \times b \times c$

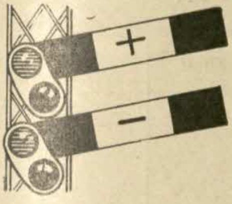
$\frac{a}{b} = a \div b.$

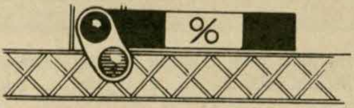
The perimeter of a circle is called the CIRCUMFERENCE.

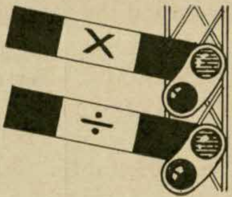
A line drawn across a circle through the centre is called a DIAMETER.

A line drawn from the centre to the circumference is called a RADIUS.









XVI. AREA

SOMETHING TO READ: THE SHORTHAND OF MATHEMATICS

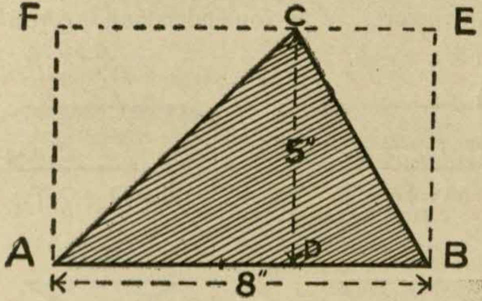
We have already seen that the rule for finding the area of a rectangle may be written shortly as $A = lb$.

$A = lb$ is called the **formula** for finding the area of a rectangle.

In the same way, $P = 2(l + b)$ is called the **formula** for finding the perimeter of a rectangle, and $V = lbh$ is the **formula** for finding the volume of a box.

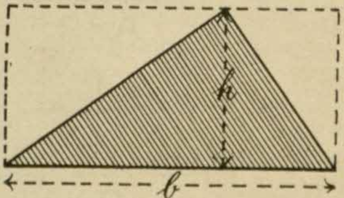
We will now try to get a **formula** for the area of a triangle.

In Exercise 30, we saw that any triangle may be considered as half of a rectangle.



Suppose the triangle ABC has a base (AB) of 8 inches and a height (CD) of 5 inches, then its area will be half of the area of the rectangle ABEF.

The rectangle ABEF is 8 inches long and 5 inches high and its area will be 8 × 5 or 40 square-inches. Then the area of the triangle ABC is a half of 8×5 or $8 \times 5 \div 2$ or $\frac{8 \times 5}{2}$ square-inches.



That is, to find the area of a triangle, we multiply the number of inches in the base by the number of inches in the height and then divide by 2 or, shortly,

$$A \text{ (of triangle)} = \frac{bh}{2}$$

$A = \frac{bh}{2}$ is called the **formula** for the area of a triangle.

EXERCISE 39. USING A FORMULA

Find the area of a triangle having a base of 10 ft. and a height of 6 ft.

$$A = \frac{bh}{2}$$

$$A = \frac{10 \times \overset{3}{\cancel{6}}}{\underset{1}{\cancel{2}}} = 30 \text{ sq.-ft.}$$

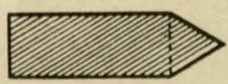
1. Find the areas of triangles having the following measurements:

(*a*) Base, 16 in. Height, 6 in.
(*b*) Base, 12 ft. Height, 8 ft.
(*c*) Base, $10\frac{1}{2}$ ft. Height, 4 ft.
(*d*) Base, 5 yd. Height, 6 yd.
(*e*) Base, 8 yd. Height, $4\frac{1}{2}$ yd.

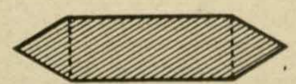
2. The area of the first figure below is equal to the area of a rectangle added to the area of a triangle. If we use *R* for the area of the rectangle and *T* for the area of the triangle, then we have:

$$A = R + T.$$

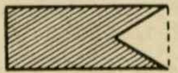
Look at the other figures. Can you understand the formula written below each drawing?



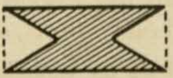
A=R+T



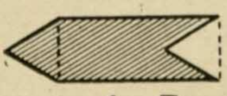
A=R+2T



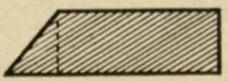
A=R−T



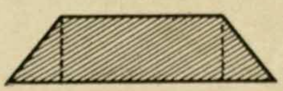
A=R−2T



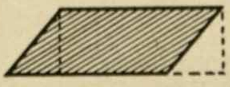
A=R



A=R+T

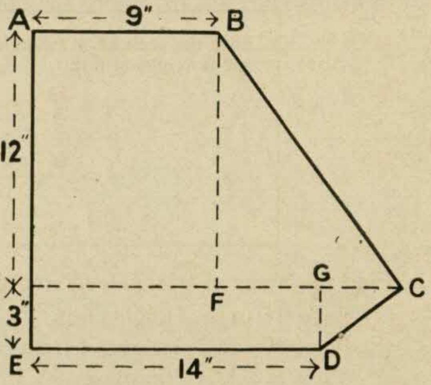


A=R+2T

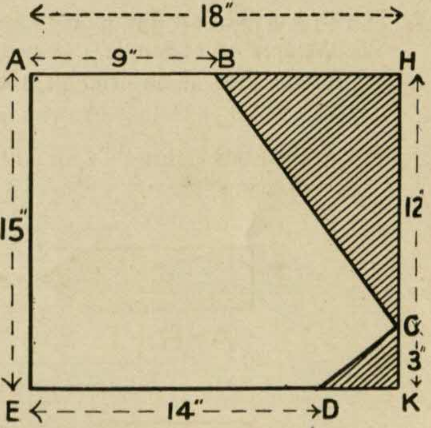


A=R

EXERCISE 40. THE COAL-BOX

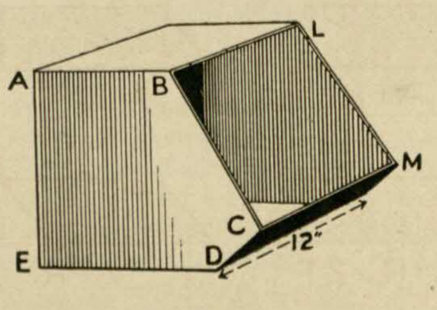


1. Look at the first diagram. It shows the side of a coal-box.
   (*a*) Make a sketch of the side, and divide it into triangles and rectangles, as shown.
   (*b*) On the sketch, fill in the lengths of: BF, FC, GC, GD.
   (*c*) What is the area of this side of the coal-box?



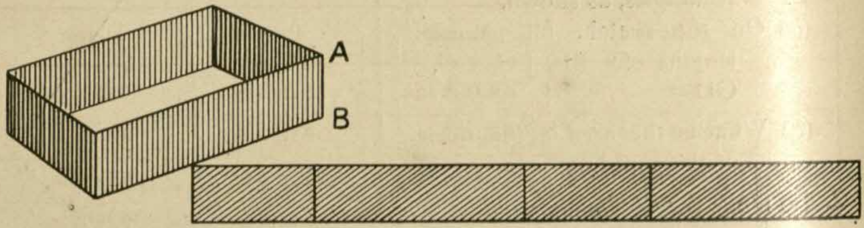
2. To make the end of the coal-box you require a sheet of metal 18 in. long and 15 in. wide.
   (*a*) What is the area of this sheet of metal?
   (*b*) What are the lengths of BH and DK?
   (*c*) What is the total area of the two shaded triangles?
   (*d*) From your answers (*a*) and (*c*), find the area of the side of the coal-box.
   Compare your answer with Question 1.

3. (*a*) Make a drawing of the side of the coal-box to the scale of $\frac{1}{4}$ in. to 1 in. *Draw the rectangle AHKE first.*
   (*b*) From your drawing, find the actual lengths of BC and DC.
   (*c*) What is the area of the cover BLMC, if the box is 12 in. wide?

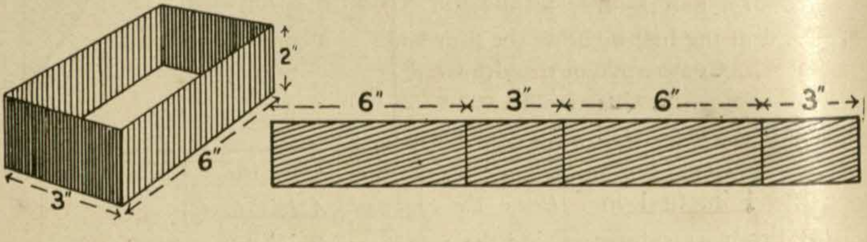


EXERCISE 41. THE WALLS OF A ROOM

1. Take any box, the inside of a matchbox will do, and break away the bottom. You will be left with four sides which can represent the four walls of a room. Cut through the edge (AB) and fold back the sides to make one long rectangle.



2. A box is 6 in. long, 3 in. wide, and 2 in. deep.
   (*a*) What is the area of one of the long sides of the box?
   (*b*) What is the area of one of the ends of the box?
   (*c*) What is the total area of the two ends and the two long sides?
   (*d*) If the sides of this box were folded back to make one long rectangle, what would be its total length?



   (*e*) What is the height of this rectangle?
   (*f*) What is the area of this rectangle? Compare your answer with that found in (*c*) above.

3. A room is 16 ft. long, 10 ft. wide, and 8 ft. 6 in. high?
   (*a*) What is the area of one of the long walls of this room?
   (*b*) What is the area of one of the end walls of this room?
   (*c*) What is the total area of the four walls of this room?
   (*d*) What is the *perimeter* of this room?
   (*e*) If the walls of this room could be folded back to make one long rectangle, what would be the total length of this long rectangle?
   (*f*) What would be the height of this long rectangle?
   (*g*) What would be the area of this long rectangle? Compare your answer with that found in (*c*) above.

4. (*a*) What is the perimeter of a room, 15 ft. 9 in. long and 9 ft. 3 in. wide?
(*b*) If this room is 10 ft. 6 in. high, what is the total area of its four walls?
(*c*) Check your answer to (*b*) by another method.

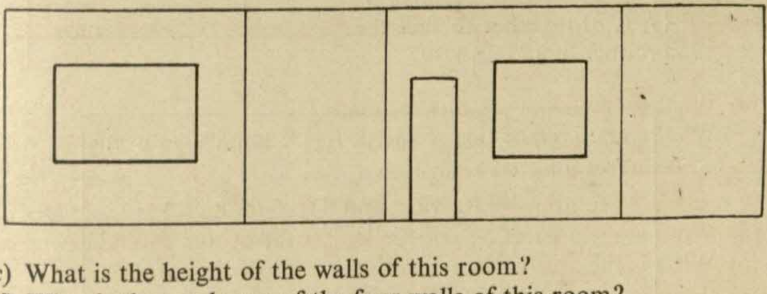
5. Find (i) the perimeter and (ii) the total area of the four walls of each of the following rooms:

	Room	Length	Breadth	Height
(a)	**Kitchen**	**9 ft. 6 in.**	**6 ft. 6 in.**	**7 ft. 6 in.**
(b)	**Kitchen**	**12 ft. 9 in.**	**9 ft. 9 in.**	**8 ft. 0 in.**
(c)	**Living-room**	**15 ft. 6 in.**	**10 ft. 6 in.**	**9 ft. 6 in.**
(d)	**Bedroom**	**11 ft. 9 in.**	**9 ft. 9 in.**	**9 ft. 6 in.**
(e)	**Classroom**	**26 ft. 10 in.**	**25 ft. 8 in.**	**13 ft.**

6. An ordinary door is usually 4 ft. higher than it is wide. Find (i) the height and (ii) the area of doors having the following widths:
(*a*) 2 ft.; (*b*) 2 ft. 3 in.; (*c*) 2 ft. 6 in.; (*d*) 2 ft. 9 in.; (*e*) 3 ft.

7. (*a*) Make a drawing of a door, 2 ft. 6 in. wide and 6 ft. 6 in. high, to the scale of: ½ in. to 1 ft.
(*b*) What is the length and breadth of your drawing?

8. The drawing below shows the four walls of a room 10 ft. long.
(*a*) What is the scale of this drawing?
(*b*) What is the width of this room?



(*c*) What is the height of the walls of this room?
(*d*) What is the total area of the four walls of this room?
(*e*) Measure the windows and door shown in the drawing and find their total area.

XVII. CHARTS AND DIAGRAMS

EXERCISE 42. READY RECKONERS

1. Look at this multiplication table. If you wish to find the product of 9 and 14, you find the 9 in the column on the left and then pass your finger along the line until it is below the 14 of the top line. Here you will find the product to be 126.

	10	11	12	13	14	15	16	17
2	20	22	24	26	28	30	32	34
3	30	33	36	39	42	45	48	51
4	40	44	48	52	56	60	64	68
5	50	55	60	65	70	75	80	85
6	60	66	72	78	84	90	96	102
7	70	77	84	91	98	105	112	119
8	80	88	96	104	112	120	128	136
9	90	99	108	117	126	135	144	153

From this table, find the products of:

(*a*) 7 and 17 (*b*) 16 and 8
(*c*) 13 and 6 (*d*) 4 and 17
(*e*) 8 and 15 (*f*) 17 and 3

2. Here is a simple ready reckoner. Use this to find the answers to:

(*a*) 122 × 5 (*b*) 122 × 6
(*c*) 122 × 80 (*d*) 122 × 60
(*e*) 122 × 70 (*f*) 122 × 300
(*g*) 122 × 90 (*h*) 122 × 7
(*i*) Add your last three answers (*f*, *g*, *h*) together to find the product of 122 and 397.

122 × 1 = 122
× 2 = 244
× 3 = 366
× 4 = 488
× 5 = 610
× 6 = 732
× 7 = 854
× 8 = 976
× 9 = 1,098

122 × 397 = (122 × 300) + (122 × 90) + (122 × 7)

Then using the ready reckoner, we have:

122 × 300 = 36,600
122 × 90 = 10,980
122 × 7 = 854

122 × 397 = 48,434

3. Work the following sums by the method above:

(*a*) 122 × 17 (*b*) 122 × 23 (*c*) 122 × 46
(*d*) 122 × 89 (*e*) 122 × 73 (*f*) 122 × 51
(*g*) 122 × 834 (*h*) 122 × 122 (*i*) 122 × 567

4. Copy, and complete, this ready reckoner so that you can find the product of 112 and any other number. Use the ready reckoner to find the answers to the following:

112 × 1 = 112
2 = 224
3 = 336
4 =
5 =
6 =
7 =
8 =
9 =

(*a*) 112 × 80 (*b*) 112 × 87
(*c*) 112 × 387 (*d*) 112 × 60
(*e*) 112 × 63 (*f*) 112 × 563
(*g*) How many pounds are there in 1 cwt.? How many pounds are there in 46 cwt.?

5. Make a ready reckoner from which you can find the product of 240 and any other number, and use the table to find the answers of the following:

(*a*) 240 × 368 (*b*) 240 × 509 (*c*) 240 × 432
(*d*) How many pence are there in £58 ?

6. Look at the ready reckoner below. To find the value of $\frac{3}{4}$*d.* × 5, the finger is placed on the 5 in the column on the left, and then passed along until it is below $\frac{3}{4}$*d.* on the top line.

From this ready reckoner, find the cost of:

(*a*) 10 lb. at 5*d.* per pound (*b*) 6 lb. at 5*d.* per pound
(*c*) 16 lb. at 5*d.* per pound (*d*) 13 lb. at 5*d.* per pound
(*e*) 9 yd. at 3*d.* a yard (*f*) 9 yd. at $\frac{3}{4}$*d.* a yard
(*g*) 9 yd. at 3$\frac{3}{4}$*d.* a yard (*h*) 9 ft. at 4$\frac{1}{4}$*d.* a foot

	$\frac{1}{4}$d.		$\frac{1}{2}$d.		$\frac{3}{4}$d.		1d.		2d.		3d.		4d.		5d.	
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
2		$\frac{1}{2}$		1		1$\frac{1}{2}$		2		4		6		8		10
3		$\frac{3}{4}$		1$\frac{1}{2}$		2$\frac{1}{4}$		3		6		9	1	-	1	3
4		1		2		3		4		8	1	-	1	4	1	8
5		1$\frac{1}{4}$		2$\frac{1}{2}$		3$\frac{3}{4}$		5		10	1	3	1	8	2	1
6		1$\frac{1}{2}$		3		4$\frac{1}{2}$		6	1	-	1	6	2	-	2	6
7		1$\frac{3}{4}$		3$\frac{1}{2}$		5$\frac{1}{4}$		7	1	2	1	9	2	4	2	11
8		2		4		6		8	1	4	2	-	2	8	3	4
9		2$\frac{1}{4}$		4$\frac{1}{2}$		6$\frac{3}{4}$		9	1	6	2	3	3	-	3	9
10		2$\frac{1}{2}$		5		7$\frac{1}{2}$		10	1	8	2	6	3	4	4	2

7. Use this ready reckoner to find how many articles could be bought for:

(*a*) 2*s.* 11*d.* at 5*d.* each (*b*) 2*s.* 3*d* at 3*d.* each
(*c*) 2*s.* 8*d.* at 4*d.* each (*d*) 1*s.* 8*d.* at 2*d.* each

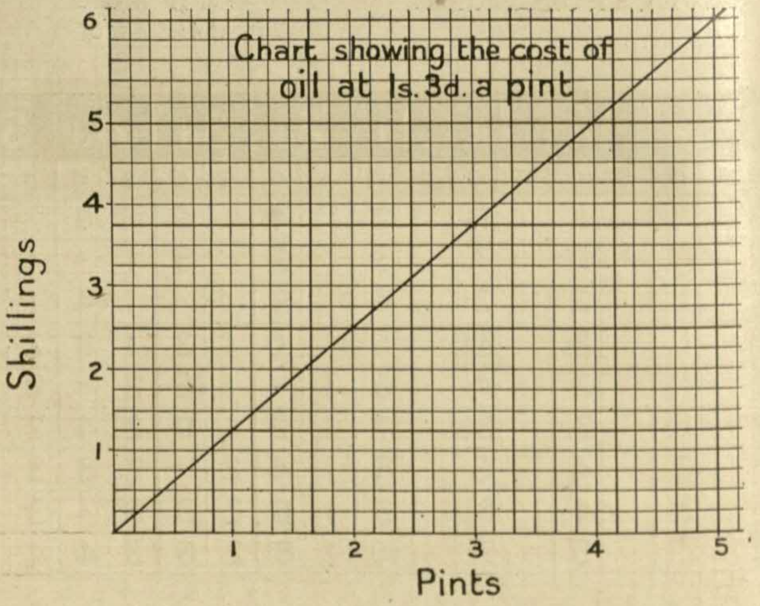
8. Shop assistants often find it helpful to make special ready reckoners for their own use. Suppose an assistant is selling ribbon at 5½*d.* a yard. If she filled in the ready reckoner at the side, she would be able to find the cost of any number of yards without much figuring. Complete the table and find the cost of:

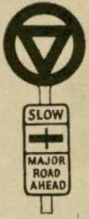
Yards	£	s	d
1			5½
2			11
3		1	4½
4		1	10
5			
6			
7			
8			
9			
10			
20			
40			

(*a*) 10 yd. (*b*) 9 yd.
(*c*) 19 yd. (*d*) 20 yd.
(*e*) 30 yd. (*f*) 7 yd.
(*g*) 37 yd. (*h*) 40 yd.
(*i*) 50 yd. (*j*) 54 yd.
(*k*) 46 yd. (*l*) 32 yd.

9. From the chart below find:

(*a*) the cost of 3 pints of oil;
(*b*) the number of pints of oil that can be bought for 5*s*.





EXERCISE 43.

A "SAFETY FIRST" CHART

1. Look at the chart below. It shows:

(i) the number of children who met with accidents in the streets of London on *schooldays* during the first three months of one year;

(ii) the time of the day at which these accidents happened.

(*a*) How many children met with accidents between 7 a.m. and 8 a.m.?

(*b*) How many children met with accidents between 8 a.m. and 9 a.m.?

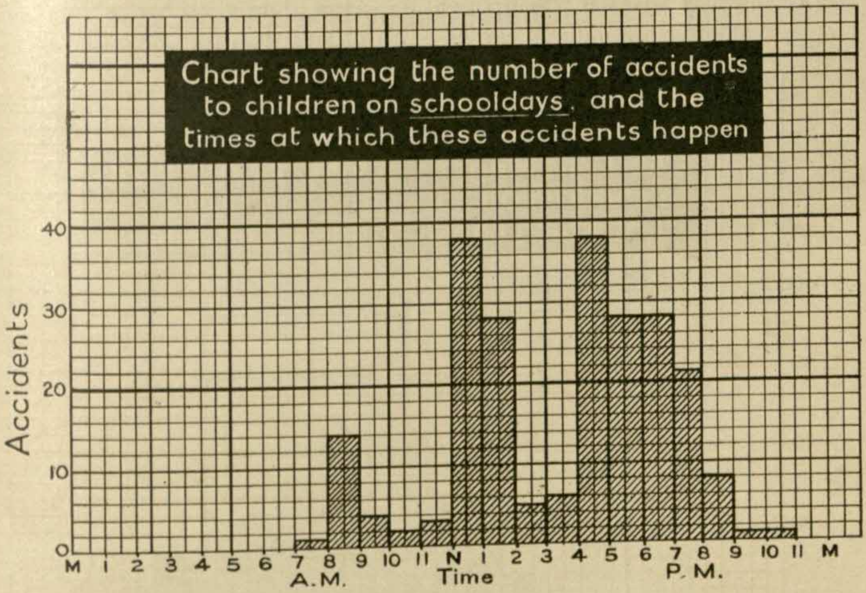
(*c*) Can you give any reason for this increase?

(*d*) How many children met with accidents between noon and 1 p.m.?

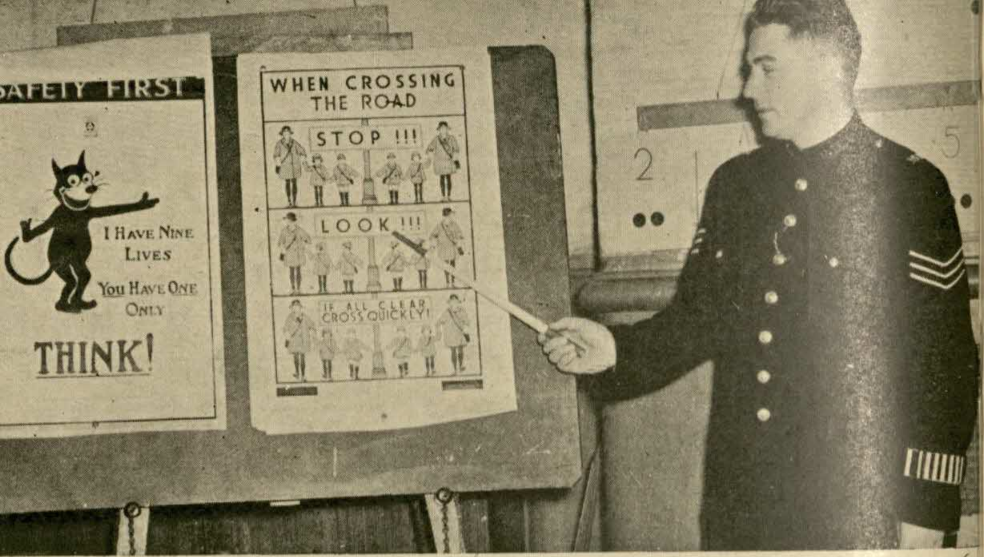
(*e*) Try to give two reasons for this large increase.

(*f*) During which other hour of the day is there a very large number of accidents? Would you have expected this? Why?

(*g*) During which hours of the day do the children play in the streets? How does the chart show this?



(*h*) How does the chart show that the London schools are open from 9 a.m. to noon, and from 2 p.m. to 4 p.m.?


AFETY FIRST
I HAVE NINE LIVES
YOU HAVE ONE ONLY
THINK!
WHEN CROSSING THE ROAD
STOP !!!
LOOK !!!
IF ALL CLEAR CROSS QUICKLY!

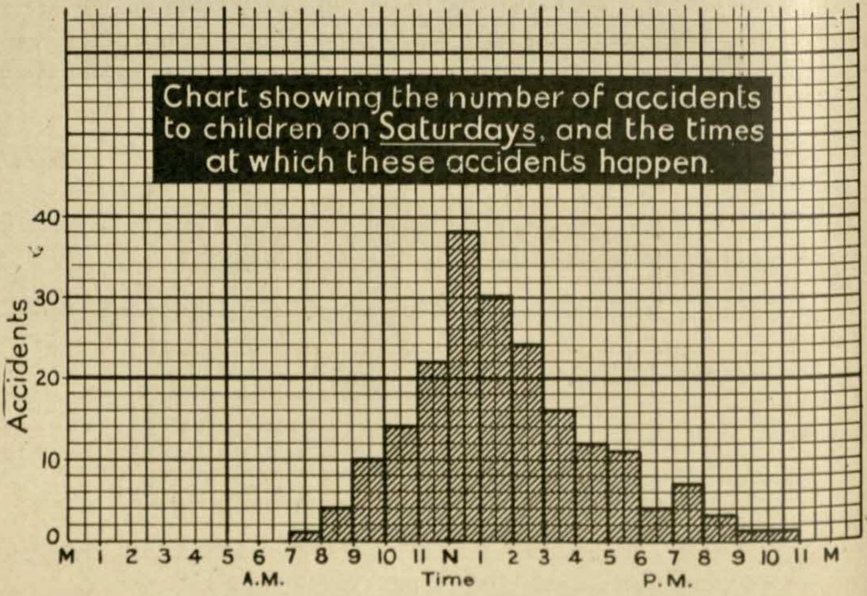
2. Look at the chart below. It shows the number of accidents to children on *Saturdays.*

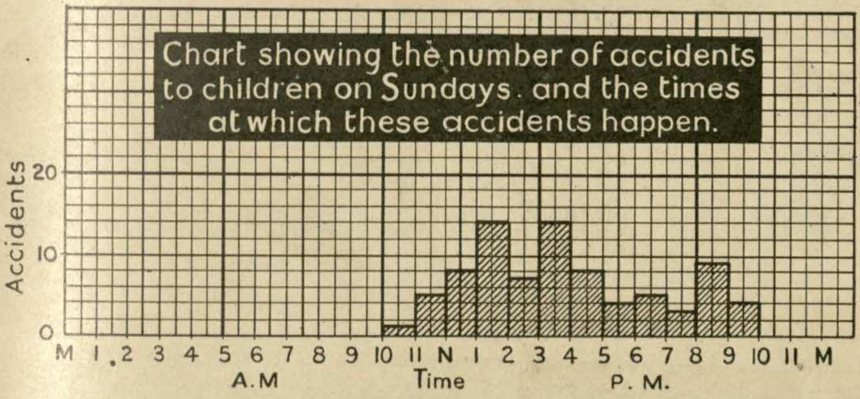
(*a*) During which hour of the day (Saturday) do most accidents happen?

(*b*) You will see that there is no great increase in the number of accidents between 8 a.m. and 9 a.m., as in the chart on page 89. Can you give a reason for this difference between the charts?

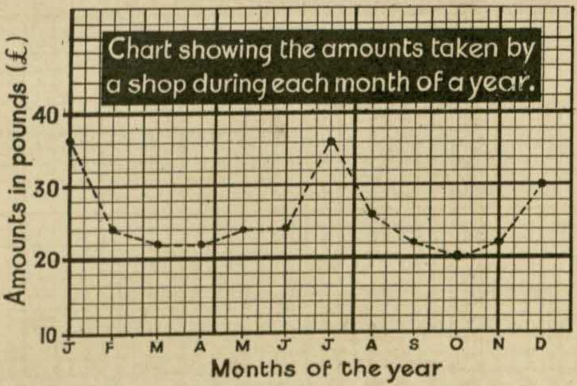
(*c*) In what way do the charts differ between 4 p.m. and 5 p.m.?

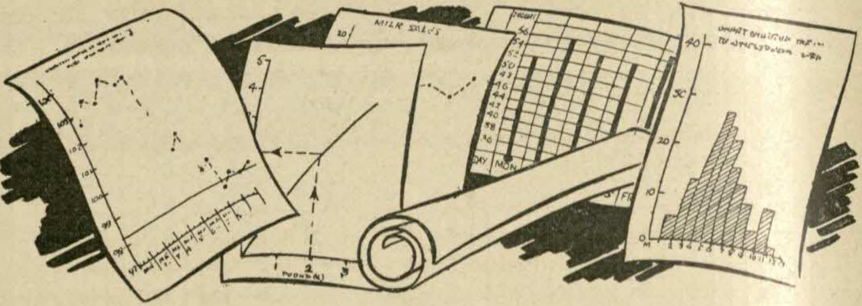
(*d*) Saturday night is "bath night." How does the chart show that children are indoors earlier on Saturdays than on school-days?





3. Look at the chart above. It shows the number of accidents to children on *Sundays.*
   - (*a*) How does this chart show that there are not so many children in the streets on Sunday?
   - (*b*) Can you give any other reason for fewer accidents on Sundays?
   - (*c*) The chart on page 89 shows that a great number of children met with accidents between noon and 1 p.m., and between 4 p.m. and 5 p.m. Can you give any reason why more children have accidents between 1 p.m. and 2 p.m. and between 3 p.m. and 4 p.m. than at any other time on Sundays?
   - (*d*) How does this chart show that the children get up later on Sundays?
4. The chart below shows the takings of a shop for each month of the year. This shop has two sales during the year. In which months did these sales take place?

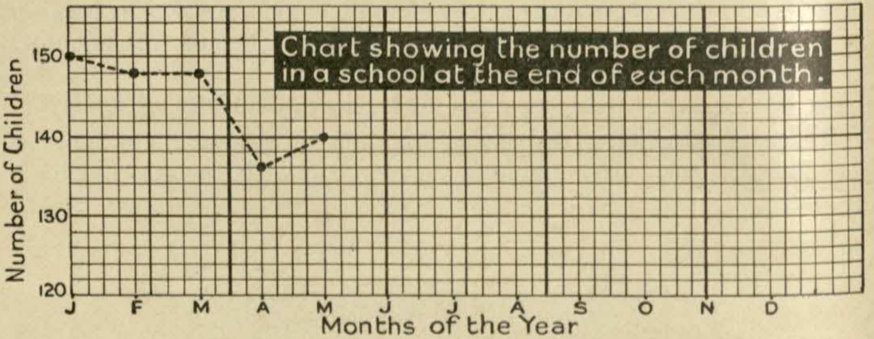




EXERCISE 44. CHART-MAKING

1. (*a*) The table below gives the number of children in a certain modern school at the end of each month of a year. Copy the chart and continue the dotted line for the other months of the year.

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
150	148	148	136	140	140	136	122	154	152	152	142



(*b*) Pupils from the primary school are admitted to this school in September. How does the dotted line show this?

(*c*) Can you give any reason for the fall of the dotted line in April, August, and December?

2. The following numbers give the temperature of a classroom at 9 a.m. for each morning of a certain week. Draw a chart to illustrate this.

Mon.	Tues.	Wed.	Thurs.	Fri.
53°	56°	50°	47°	48°

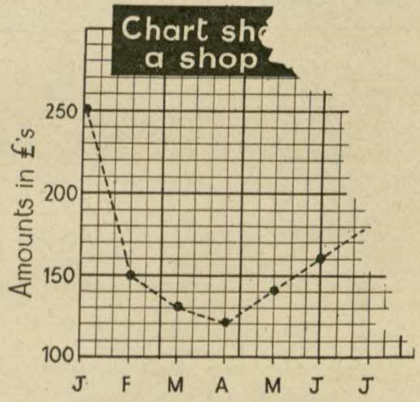
Take five squares along the horizontal line to represent a day, and one square along the vertical line for each degree of temperature. *Temperatures below* 40° *need not be shown.* Give your chart a suitable title.

3. The table below gives the amounts in pounds (£'s) taken by a shop during each month of the year.

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
250	150	130	120	140	160	250	160	130	120	140	190

(*a*) Draw a chart to show this. Take three small squares along the horizontal line for each month, and let one small square along the vertical line represent £10. Give your chart a suitable title.
A part of this chart is shown.

(*b*) This shop had two *bargain sales* during the year. In which months did these sales take place?



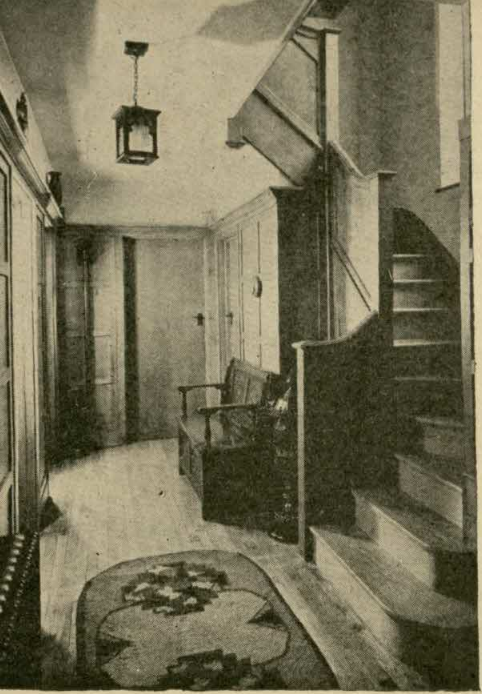
4. The height of the water in a rain-water tank was measured each evening for a week. On Sunday, the water was 12½ in. high, and on the following six days it stood at 12, 9½, 9, 15, 14, and 13½ inches.

(*a*) Draw a chart to show this. Take five squares along the horizontal line for a day, and two squares along the vertical line to represent an inch. Give your chart a suitable title.

(*b*) On which day of the week did it rain?

(*c*) The owner of this tank uses the water for washing his car. On which day of this week did he wash the car?

Note. On pages 51 and 88 you will see charts which are used as ready reckoners.



XVIII. IN THE HOUSE

EXERCISE 45. THE HALL

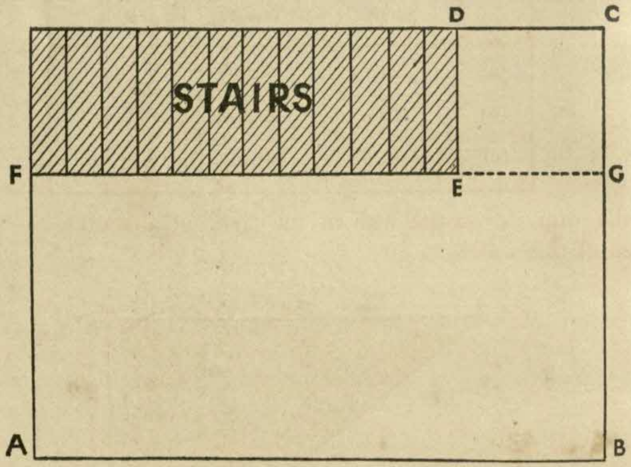
1. (*a*) Below is a plan of a hall drawn to scale. What is the length of the line AB?

   (*b*) The actual length of this side of the hall is 12 ft. What is the scale of the plan?

   (*c*) What is the length of the line CD?

   (*d*) What is the actual length of this side of the hall?

   (*e*) Find the actual lengths of the sides of the hall shown by the lines: AF, BC, FE.

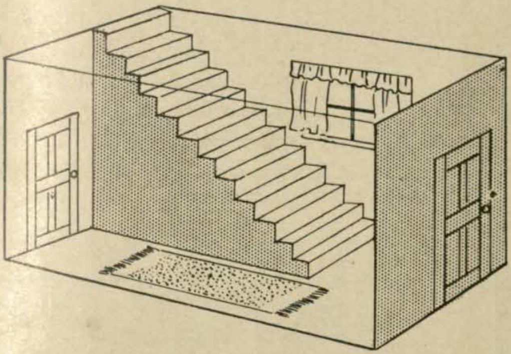


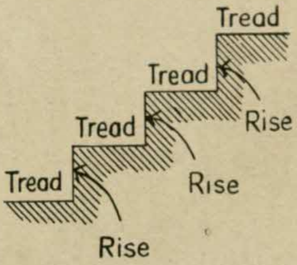
2. (*a*) The dotted line on the plan shows that the floor of this hall can be divided into two rectangles, DCGE and ABGF. Find the area of the floor in sq.-ft.

   (*b*) A part of the floor is covered by a rug 4 ft. by 6 ft., and the remainder is stained. What is the area of the stained part?

   (*c*) What did this staining cost at 6*d*. a sq.-ft.?

3. There are 12 steps in the stairs and each has a *tread* of 9 in., and a *rise* of 7 in. Find the length of carpet you would buy to cover these stairs. Allow an extra length of 12 in. at the foot and also at the top.



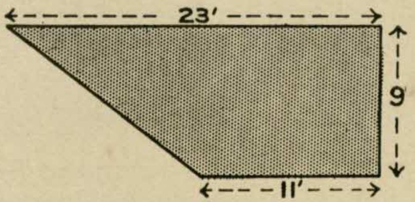


4. How many yards of carpet are required for stairs with 16 steps if each has a tread of 8 in. and a rise of $7\frac{1}{2}$ in.? Allow an extra yard of carpet.

5. Find the number of yards of carpet required for the stairs in the table below. Allow an extra yard for each.

	Steps	**Tread**	**Rise**
(a)	**24**	**9 in.**	**7 in.**
(b)	**20**	**8 in.**	**$7\frac{1}{2}$ in.**
(c)	**32**	**10 in.**	**$6\frac{1}{2}$ in.**

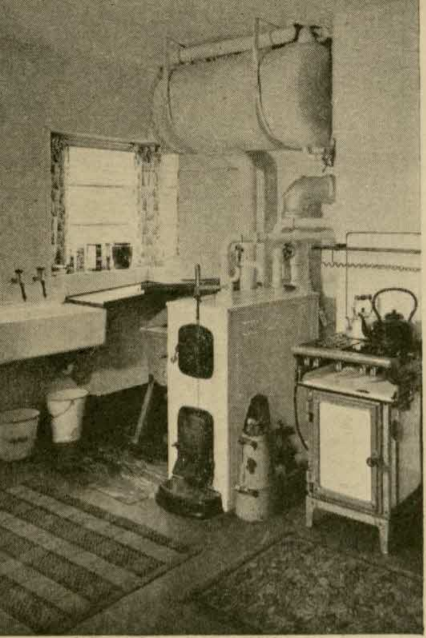
6. The diagram shows the wall at the right of a staircase. What is the area of this wall?



7. (*a*) Find the total cost of: Hall-stand: £9 5*s.* 0*d.*; Hall-table: £11 9*s.* 6*d.*; Two chairs: 45*s.* 9*d.* each; Rug: 33*s.* 9*d.*

(*b*) If the householder allowed £28 for the furnishing of this hall, how much has he left for the stair carpet?

(*c*) He finds that 9 yd. of carpet will be required. What price can he pay per yard for the carpet?

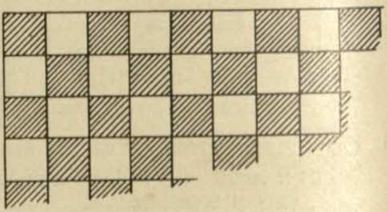


EXERCISE 46. THE KITCHEN

1. (*a*) Find the area of the floor of a kitchen 9 ft. 6 in. by 8 ft.

(*b*) Suppose you are going to cover this floor with tiles, 6 in. square, and that you have placed a row near one of the long sides. How many tiles have you used?

(*c*) How many rows of tiles are needed to cover the floor?

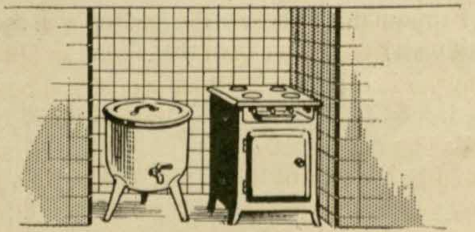


(*d*) How many tiles will be necessary to cover the floor?

(*e*) How many tiles, 3 in. square, would you require to cover the floor of this kitchen? Check your answer.

2. (*a*) A kitchen has a recess for a cooker and hot-water boiler. This recess is 2 ft. 6 in. deep, 7 ft. 6 in. wide and 6 ft. 8 in. high. How many tiles, 5 in. square, are required to tile the back and side walls of this recess.

(*b*) What would these tiles cost at 12*s*. 6*d*. a dozen?

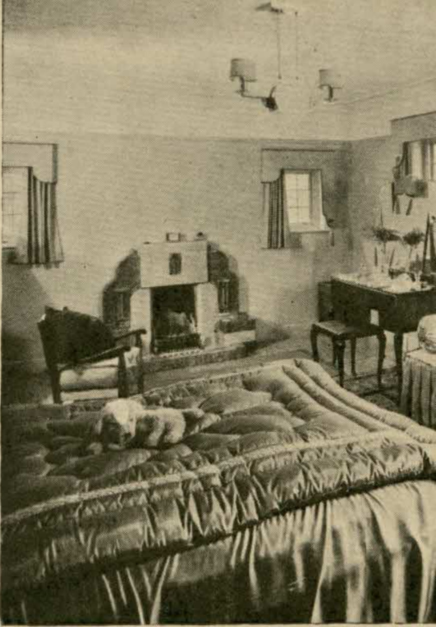


3. (*a*) A kitchen, 12 ft. 6 in. by 10 ft., has a door 2 ft. 9 in. wide, a window 4 ft. 3 in. wide, and a recess 7 ft. wide. What will it cost to have a picture-rail placed round this room, if the wood costs $2\frac{1}{2}$*d*. a foot and the carpenter charges 10*s*. for fixing? The rail is not to be placed above the door, the window and the recess. Give your answer to the nearest sixpence.

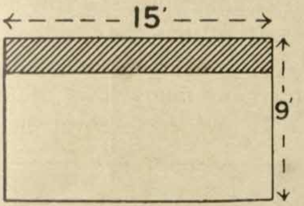
(*b*) What is the area of the ceiling to the nearest square-yard?

(*c*) What will be the cost of whitening the ceiling at 6*d*. a square-yard?

EXERCISE 47. UPSTAIRS



1. (*a*) Look at this plan of a bedroom. The shaded portion shows a strip of carpet, 27″ wide. What is the length of this strip?

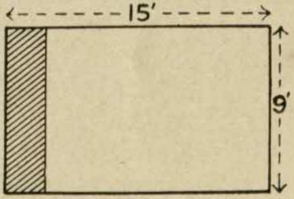


(*b*) How many such strips will be required to cover the floor of this bedroom?

(*c*) What is the total length of carpet required?

(*d*) Carpet may also be obtained 36″ wide. How many strips of this width would be required for this room?

(*e*) How many yards of carpet 36″ wide would be required for this room?



2. (*a*) The second plan shows the same room with carpet 27″ wide along the 9 ft. wall. How many strips are now required?

(*b*) How many yards of carpet 27″ wide would be required to cover the bedroom in this way?

(*c*) Why is your answer greater than that found in Question 1 (*c*)?

3. (*a*) How many yards of carpet 27″ wide would you buy to cover the floor of a bedroom 11′ by 13′ 6″? Draw sketches to find the cheaper way of laying the carpet.

(*b*) What would be the cost of this carpet at 13*s*. 9*d*. a yard?

4. (*a*) How many yards of carpet 36″ wide would you buy to cover the floor of a bedroom 12′ by 10′ 6″? Draw sketches to find the cheaper way of laying the carpet.

(*b*) What would be the cost of this carpet at 15*s*. a yard?

5. (*a*) Linoleum is 6 ft. wide. How many square-yards are there in a length of 5 yd.?

(*b*) How many yards of linoleum are required to cover the floor of a bathroom 12 ft. by 7 ft. 6 in.? Draw a sketch to show how this linoleum is laid.

(*c*) What is the cost of this linoleum at 8*s*. 11*d*. a square-yard?

XIX. FURNISHING THE HOUSE

EXERCISE 48. PERCENTAGES

$$15\% \text{ of } 2{,}450 = \frac{\overset{3}{\cancel{15}}}{\underset{\underset{2}{\cancel{20}}}{\cancel{100}}} \times \overset{245}{\cancel{2450}} = \frac{735}{2} = 367\tfrac{1}{2}$$

1. Write the answers to the following:

(*a*) 50% of 240
(*b*) 25% of 624
(*c*) 12½% of 720
(*d*) 10% of £7
(*e*) 20% of £1 15*s*.
(*f*) 5% of £6
(*g*) 2½% of 6*s*. 8*d*.
(*h*) 33⅓% of 16*s*.
(*i*) 66⅔% of 15*s*.

2. Find the value of:

(*a*) 5% of £2
(*b*) 10% of £6 15*s*.
(*c*) 15% of £3 5*s*.
(*d*) 20% of £5 5*s*.
(*e*) 33⅓% of 13*s*. 3*d*.
(*f*) 50% of 7*s*. 6*d*.
(*g*) 40% of 5*s*.
(*h*) 75% of 12*s*. 6*d*.
(*i*) 66⅔% of 3*s*. 6*d*.

3. Find the value of:

(*a*) 5% of 1 ft. 8 in.
(*b*) 10% of 6 yd. 2 ft.
(*c*) 25% of 1 mile
(*d*) 12½% of 1 cwt.
(*e*) 20% of 2 qr. 4 lb.
(*f*) 33⅓% of 6 cwt.
(*g*) 30% of 2½ gal.
(*h*) 40% of 5 gal.
(*i*) 90% of 6¼ gal.

4. Find the value of:

(*a*) 75% of 15½ miles
(*b*) 5% of £26 15*s*.
(*c*) 40% of 13 tons 5 cwt.
(*d*) 60% of £17 12*s*. 6*d*.
(*e*) 16% of £105
(*f*) 3¾% of £20
(*g*) 62½% of 456
(*h*) 78% of 350
(*i*) 8⅓% of £18
(*j*) 87½% of 20 gal.

Increase £15 by 20%
20% of £15 = ⅕ of £15 = £3
∴ £15 increased by 20% = £15 + £3 = £18

5. Increase :

(*a*) 220 by 20%
(*b*) 360 by 25%
(*c*) 70 by 10%
(*d*) 112 by 50%
(*e*) 168 by 12½%
(*f*) 105 by 33⅓%
(*g*) 240 by 15%
(*h*) 18·6 by 20%
(*i*) 300 by 30%

6. Decrease:

(*a*) 305 by 20% (*b*) 152 by 25% (*c*) 70 by 10%
(*d*) 215 by 40% (*e*) 720 by 35% (*f*) 105 by 33⅓%

7. Increase each of the following by 12½%:

(*a*) 320 (*b*) £36 10*s*. (*c*) 3 tons 12 cwt. (*d*) 20 yd.
(*e*) 12 hr. (*f*) 9 st. 10 lb. (*g*) 27 gal. (*h*) £107 16*s*.

8. Decrease each of the following by 10%:

(*a*) 50 (*b*) £8 15*s*. (*c*) 1 cwt. 1 qr.
(*d*) 15 gal. (*e*) 3 hr. 20 min. (*f*) 6 lb. 4 oz.
(*g*) 4 yd. 1 ft. 4 in. (*h*) £110 11*s*. 8*d*. (*i*) 350

9. During a sale, a firm decides to reduce its prices by 20%. Find the sale prices of the following coats:

Model A, 52*s*. 6*d*. Model B, 45*s*. Model C, 37*s*. 6*d*.
Model D, 33*s*. 9*d*. Model E, 27*s*. 6*d*. Model F, 36*s*. 8*d*.

10. A glove manufacturer is having a new catalogue printed, and he decides to increase all his prices by 12½%. Find his new prices for the following:

(*a*) Black gauntlets, 19*s*. 4*d*. (*b*) Tan gauntlets, 32*s*.
(*c*) Lamb's-wool gauntlets, 17*s*. 4*d*. (*d*) Wrist gloves, 15*s*. 4*d*.
(*e*) Sheepskin mitts, 14*s*. 8*d*. (*f*) Driving gloves, 36*s*.

11. A builder finds that 4% of his bricks are broken during the loading and unloading of the lorry. How many whole bricks would he expect from an order of 1,250?

12. The price of a car, which could have been bought for £660, has been increased by 5%. What is the new price?

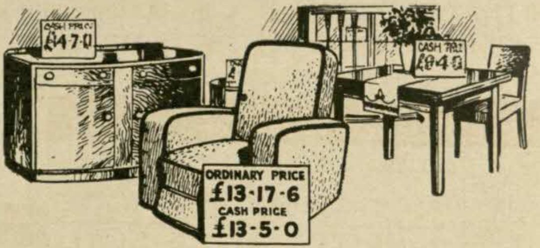
13. (*a*) A town had a population of 3,600. If this population was increased by 10%, how many people were there in the town?

(*b*) If the population of the town increased by a further 10%, how many people would there be in the town?

14. A 5-gallon can lost 12½% of its contents by leakage. How many pints were left in the can?

15. A carpet is priced at £22 10*s*. What would you pay for this carpet if the price was reduced by 5%?

16. The salary of a clerk has been increased by 25%. If he now receives £200 a year, what was his salary before the increase?



EXERCISE 49. DISCOUNT

All tradespeople desire their customers to pay their bills as soon as possible, and as a reward for early payment they often take off a small amount from the total of the bill.

The easy-chair shown in the picture above is valued at £13 17s. 6d., but may be bought for £13 5s., if paid for at the time of purchase. The difference of 12s. 6d. is the reward for early payment, and is called the CASH DISCOUNT.

1. Find the cash discount on each of the following articles:

(*a*) Desk: Ordinary price, £16 10*s.*; Cash price, £15 17*s.* 6*d.*
(*b*) Carpet: Ordinary price, £25 12*s.* 6*d.*; Cash price, £24 18*s.*
(*c*) Table: Ordinary price, 63*s.* 6*d.*; Cash price, 55*s.* 9*d.*

2. A certain tradesman allows a cash discount of 1*s.* in the pound for prompt payment.

(*a*) What cash discount will he allow on articles valued at:
£4 £6 10*s.* £3 5*s.* £7 15*s.* £11 6*s.* 8*d.*?
(*b*) What would be the cash price for each of these articles?

3. Find the cash discount on:

(*a*) £1 8*s.* at 2*d.* in the 1/-
(*b*) £3 10*s.* at 3*d.* in the 1/-
(*c*) £35 10*s.* at 6*d.* in the £
(*d*) £56 16*s.* at 2*s.* 6*d.* in the £

4. On 1st November my tailor sent me a bill for a suit which cost £16 10*s.*, and I noticed that he would allow a cash discount of 5% if the payment was made before the end of the month.

(*a*) I paid for this suit on 23rd November. What discount did the tailor allow me?
(*b*) How much did the suit cost me?
(*c*) What would the suit have cost me if I paid for it in December?

5. Find the cash discount on:

(*a*) £2 15*s.* at 10%
(*b*) £5 17*s.* 6*d.* at 20%
(*c*) 13*s.* 4*d.* at 5%
(*d*) £3 15*s.* at 4%

6. Find the cash discount on:

(*a*) £27 15*s.* at 2*s.* in the pound
(*b*) £55 10*s.* at 10%
(*c*) £9 5*s.* at 5%
(*d*) £17 at 12½%

7. In the first line of the table below you will see that 10% is equal to $\frac{1}{10}$, or 0·1, or 2*s.* in the pound. Copy the table into your book and fill in the other lines.

Percentage	Vulgar Fraction	Decimal Fraction	Amount in £	Amount in 1/-
10	$\frac{1}{10}$	0·1	2/-	
5				
2½				
20				
25				
12½				
33⅓				
8⅓				

2½% = $\frac{1}{40}$ = 6d. in the pound.
∴ 2½% of £26 = 26 sixpences = 13s.

8. Write down:
   (*a*) 2½% of £15 (*b*) 2½% of £106 (*c*) 2½% of £7 10*s.*
   (*d*) 5% of £17 (*e*) 5% of £88 (*f*) 5% of £3 15*s.*

9. My water rate for the half-year ending on 30th September was 18*s.* 4*d.*, but I am allowed a discount of 5% if the account is paid on or before 25th October. How much shall I pay on 7th October to settle this account?

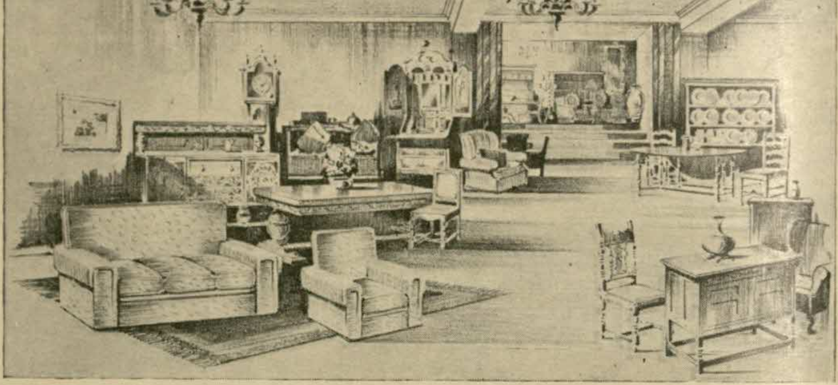
10. My gas bill for last quarter amounted to 13*s.* 2*d.*, and I am allowed a discount of 1*d.* in the shilling if I pay the bill within a fortnight.
    (*a*) How much can I save by making early payment?
    (*b*) What will be the amount I shall pay?

11. (*a*) An ironmonger bought a lawn-mower for £11 18*s.* 9*d.* and sold it for £13 10*s.* What profit did he make?
    (*b*) What profit would he make if he allowed his customer a discount of 5%?

12. (*a*) What is the discount on £12 at 12½%?
    (*b*) From your last answer, find the discount on £12 at 6¼%.
    (*c*) What is the discount on £9, £3 12*s.*, and £6 8*s.* at 6¼%?

13. (*a*) 16⅔% is a half of 33⅓%. Find the discount on 18*s.*, 13*s.* 6*d.*, and £1 11*s.* at 16⅔%.
    (*b*) 3⅓% is a third of 10%. Find the discount on £2 10*s.*, £7 10*s.*, and £3 7*s.* 6*d.* at 3⅓%.

14. (*a*) What is the discount on £16 at 2½% (6*d.* in the pound)?
    (*b*) What is the discount on £16 at 1¼% (3*d.* in the pound)?
    (*c*) From your answers, find the discount on £16 at 3¾%.
    (*d*) What is the discount on £36, £52, and £24 at 3¾%?



EXERCISE 50. BUYING THE FURNITURE

1. (*a*) A young married couple have saved £240 to buy the furniture for their house. They decide to spend $\frac{1}{8}$ of this amount on the hall, $\frac{1}{3}$ on the living-room, $\frac{1}{4}$ on the best bedroom, and $\frac{1}{6}$ on the second bedroom. What fraction of the amount have they kept for the kitchen and bathroom?

   (*b*) Find the amount allowed for each room, omitting kitchen and bathroom.

   (*c*) The remainder is divided equally for furnishing the kitchen and bathroom. What is spent on each of these rooms?

2. (*a*) Find the total cost of: Sideboard, £18 12*s*. 6*d*.; Table, £12 7*s*. 6*d*.; Bookcase, £9 15*s*.; Four chairs at 31*s*. 3*d*. each.

   (*b*) This furniture may be obtained for 20*s*. 6*d*. a week for a year (52 weeks). What is the cost of the furniture by this method of payment?

This second method of paying for the furniture is called the HIRE-PURCHASE SYSTEM. The furniture is not really ours—it is hired—until we have completed all the payments (or INSTALMENTS) of 20s. 6d. We have been HIRING the goods for 52 weeks, and the tradesman has made an extra charge of £6 6s. above the ready-money or cash price of the furniture.

3. A furniture dealer offered a bedroom *suite* (or set) for £29 15*s*., or for £5 down and 24 monthly payments of 23*s*. 4*d*.

   (*a*) What will this suite cost under the hire-purchase system?

   (*b*) How much is the dealer charging for the hire of the suite for two years?

4. (*a*) How many weeks will it take to pay for a wireless set costing 15 guineas at 17*s*. 6*d*. a week?

   (*b*) How much could be saved by paying cash down if the set were offered at £14 10*s*.?

5. A dining-room suite is advertised for sale at £49 12*s*. 6*d*. cash, or for £52 10*s*. on the instalment plan.

   (*a*) What is the amount of each weekly instalment if the payments are to be completed in 21 weeks?

   (*b*) What amount is being charged for the hire of this suite for 21 weeks?

6. A garden shed is offered at the following prices: £12 17*s.* cash, 6 monthly payments of £2 7*s.* 6*d.*, or 12 monthly payments of £1 6*s.* 6*d.*

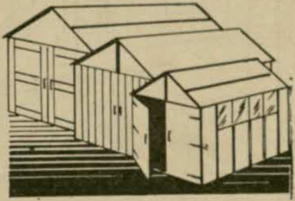
(*a*) What is being charged for the hire of this shed for six months?

(*b*) What is being charged for the hire of the shed for twelve months?

7. Wooden garages are advertised for sale at the prices shown below: Find (i) the cost of each under the hire-purchase system;

(ii) the amount which could be saved by paying cash in each case.

SIZE	CASH	12 MONTHLY PAYMENTS
A	£5 · 4s. 0d.	9s. 8d.
B	£6 · 10s. 0d.	12s. 0d.
C	£6 · 16s. 0d	12s. 6d.
D	£30 · 10s. 0d.	£2 · 15s. 11d.



8. On squared paper, draw a rectangle 2·4 in. by 1 in.

(*a*) Shade $\frac{1}{8}$ of this rectangle and print the word "Hall" in the shaded portion.

(*b*) Shade $\frac{1}{3}$ of the rectangle and print the word "Living-room" in this portion.

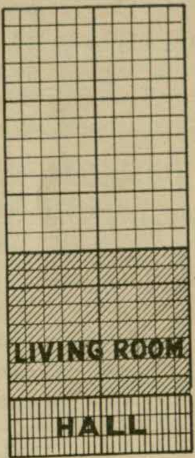
(*c*) Refer to Question 1, and shade portions of the rectangle to show the fractions of £240 allowed for: (i) the best bedroom; (ii) the second bedroom; (iii) the kitchen; (iv) the bathroom.

(*d*) How many small squares are there in the large rectangle?

(*e*) The large rectangle represents £240. How much is represented by each small square?

(*f*) How many small squares are there in the shaded portion marked "Hall"?

(*g*) What amount of money is represented by this portion?



9. (*a*) How many degrees are there in a circle?

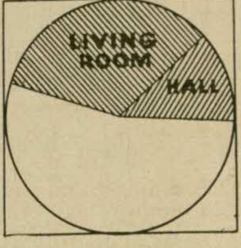
(*b*) How many degrees are there in $\frac{1}{8}$ of a circle?

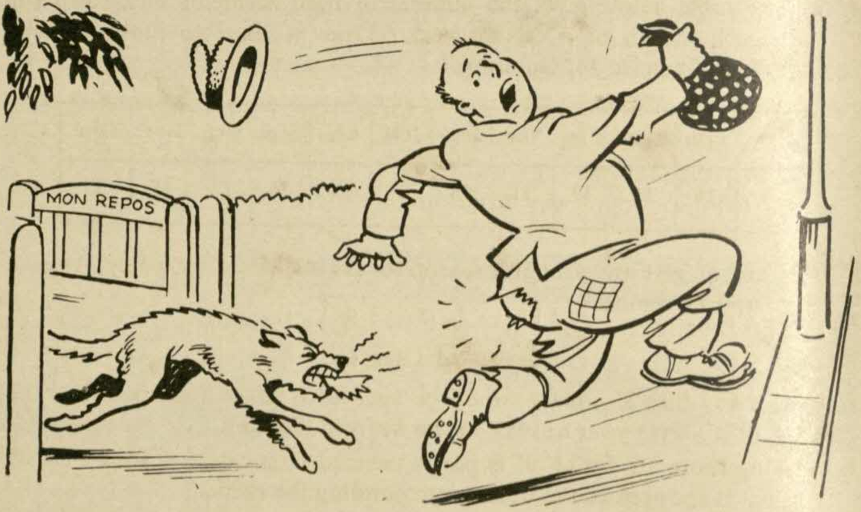
(*c*) Draw a circle and shade $\frac{1}{8}$ to represent the amount spent on the hall.

(*d*) How many degrees are there in $\frac{1}{3}$ of a circle?

(*e*) Shade $\frac{1}{3}$ of the circle to represent the amount spent on the living-room.

(*f*) Shade portions of the circle to show the fractions spent on: (i) best bedroom; (ii) second bedroom; (iii) kitchen; (iv) bathroom.



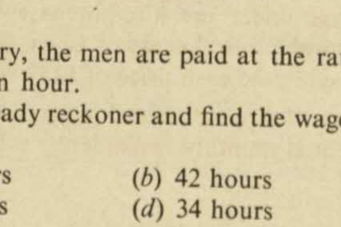


XX. REVISION

EXERCISE 51. LOOKING BACKWARDS

First Glance

1. The shaded figure consists of a rectangle and triangles. Using R for the area of a rectangle and T for the area of each triangle, write a formula for the area of the shaded figure.



2. In a certain factory, the men are paid at the rate of 1*s*. $2\frac{1}{4}$*d.* an hour.

   Complete the ready reckoner and find the wages for:

   (*a*) 26 hours (*b*) 42 hours
   (*c*) 38 hours (*d*) 34 hours

Hours	£	s.	d.
1		1	$2\frac{1}{4}$
2		2	$4\frac{1}{2}$
3			
4			
5			
6			
7			
8			
9			
10			
20			
40			

3. Find how many yards of carpet would be required for stairs with 21 steps, each having a rise of $7\frac{1}{2}''$ and a tread of 8″. Allow 1 yd. extra, and give your answer to the nearest yard.

4. (*a*) The table below gives the number of road accidents in a town for each month of a certain year. Draw a chart to illustrate this. (See Exercise 44, Question 1.)

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
14	10	15	19	11	18	23	31	18	13	15	22

(*b*) Can you give any probable reason for the increase during July, August, and December?

Second Glance

1. How many tiles 8″ square would be needed to cover a kitchen floor 12′ by 10′? Give your answer to the nearest 100 tiles.
2. A living-room 16′ by 11′ 9″ is partly covered by a carpet 4 yd. by 3½ yd. What is the area of the border surrounding the carpet?
3. What will it cost to cover the floor of a room 13′ 6″ long and 9′ 6″ wide with carpet 27″ wide at 12*s*. 9*d*. a yard? Draw sketches, and find the cheaper way of laying the carpet.
4. (*a*) Find the value of 37½% of £2 15*s*. 4*d*.
   (*b*) Increase £3 16*s*. 8*d*. by 10%.
   (*c*) Decrease £1 17*s*. 6*d*. by 5%.

Third Glance

1. Find the discount at 2*d*. in the shilling on:
   (*a*) £1 5*s*.
   (*b*) £4 13*s*.
   (*c*) £2 9*s*. 6*d*.
   (*d*) £3 3*s*. 6*d*.
   (*e*) £1 0*s*. 6*d*.
   (*f*) £2 10*s*. 6*d*.
2. Find the discount at 5% on :
   (*a*) £2 10*s*.
   (*b*) £5 12*s*. 6*d*.
   (*c*) £6 11*s*. 3*d*.
   (*d*) £3 4*s*. 7*d*.
   (*e*) £2 14*s*. 2*d*.
   (*f*) £1 6*s*. 8*d*.
3. Jones bought a garage under the hire-purchase system by paying £5 down and twelve monthly instalments of £2 1*s*. 9*d*. How much could he have saved by paying the cash price of £25?
4. The hire-purchase price of a piano was 63 guineas, and it was offered for £10 down and 12 equal monthly instalments. What was the amount of each instalment?

EXERCISE 52. MECHANICAL SUMS

Set A. Simple Rules

1. Write the following numbers in words:
(*a*) 3,105 (*b*) 23,036 (*c*) 58,731 (*d*) 23,306 (*e*) 50,007

2. Write the following in figures: (*a*) Six thousand, four hundred and ninety-two; (*b*) Twenty-two thousand and thirty-eight; (*c*) Thirty thousand, two hundred and two.

3. (*a*) What is (i) the largest and (ii) the smallest number you can make by rearranging the figures of the number 3,825?
(*b*) What is the largest number of four figures which begins with 6 and ends with 3?
(*c*) What is the smallest number of four figures which begins with 6 and ends with 3?

4. Add both across and downwards and find the grand total:

238	109	254	365	
461	296	371	501	
708	117	126	197	
386	213	409	255	

5. What number must be added to 37,682 to make 68,709?
6. 395 × 68 **7.** 278 × 93 **8.** 684 × 605
9. 50,246 ÷ 17 **10.** 17,536 ÷ 28

Set B. Compound Rules

1. £3 18*s.* 2½*d.* + £7 10*s.* 5¾*d.* + £15 5*s.* 7½*d.* + £1 11*s.* 1¼*d.*
2. £410 2*s.* 6*d.* − £96 14*s.* 10½*d.* **3.** £7 12*s.* 7½*d.* × 45
4. £672 18*s.* 10*d.* ÷ 23
5. How many times is £2 12*s.* contained in £54 12*s.* 0*d.*?
6. 3 cwt. 2 qr. 15 lb. + 7 cwt. 1 qr. 23 lb. + 5 cwt. 16 lb.
7. 32 lb. 7½ oz. − 27 lb. 11¾ oz.
8. 5 tons 9 cwt. 2 qr. × 13
9. How many times is 5 st. 10 lb. contained in 1 ton?
10. 9 ml. 6 fur. 4 chn. ÷ 49
11. 4 gal. 3 qt. 1 pt. × 24 **12.** 732 yd. 1 ft. ÷ 26

Set C. Finding the Cost

What is the price of:

1. 1 yd. when 13 yd. cost £3 8*s.* 9½*d.*? **2.** 1 lb. when 5¾ lb. cost 3*s.* 10*d.*?
3. 3¼ gal. when 7½ gal. cost 5*s.*? **4.** 12 tons 9 cwt. at £3 5*s.* a ton?
5. 7 cwt. 3 qr. at 2*s.* 4*d.* per hundredweight?

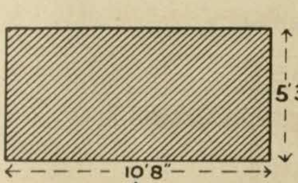
Set D. Fractions

1. Arrange the fractions $\frac{5}{8}$, $\frac{13}{20}$, $\frac{3}{5}$ in order, placing the largest first.
2. $6\frac{2}{3} + 2\frac{5}{8} - 3\frac{3}{4}$
3. $5\frac{4}{9} \times 3\frac{1}{7}$
4. $297 \times 35 \div 495$
5. Find the value of $\frac{3}{5}$ of £22 14*s.* 2*d.*
6. What fraction is 4 ft. 1 in. of $3\frac{1}{2}$ yd.?
7. Find the larger of the fractions, $\frac{21}{25}$ and $\frac{29}{36}$, by writing them as decimals.
8. $16{\cdot}023 - 9{\cdot}68 + 11{\cdot}06$
9. $51{\cdot}3 \times 3{\cdot}6$
10. $590{\cdot}52 \div 8{\cdot}4$
11. $5{\cdot}625 \div 0{\cdot}09$
12. What fraction is 6*s.* 3*d.* of £3 2*s.* 6*d.*? Write your answer as a decimal fraction.

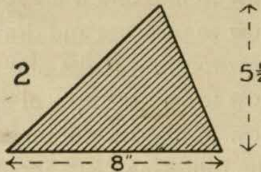
Set E. Area

Find the area of each of the following figures:

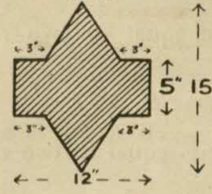
1



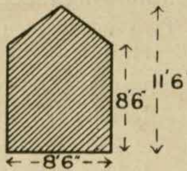
2



3



4



5. What is the height of a triangle having an area of 42 sq. in. and a base of $10\frac{1}{2}$ in.?

Set F. Percentages

1. Write each of the following percentages as vulgar and as decimal fractions:

   (*a*) 15% (*b*) 80% (*c*) 55% (*d*) 28% (*e*) 16%

Find the value of:

2. 20% of £7 12*s.* 6*d.*
3. $12\frac{1}{2}$% of 7 cwt.
4. 40% of 3 yd. 1 ft.
5. $4\frac{1}{2}$% of 16*s.* 8*d.*
6. $17\frac{1}{2}$% of £17 10*s.*
7. $3\frac{1}{3}$% of £1 12*s.* 6*d.*
8. Increase 256 by $12\frac{1}{2}$%
9. Increase 5*s.* 10*d.* by 30%
10. Decrease 256 by 25%
11. Decrease 5*s.* 10*d.* by 5%
12. Find the number of which 21 is 7%
13. Find the amount of which 2*s.* 9*d.* is 10%
14. Find the weight of which 3 lb. 4 oz. is 40%
15. Find the length of which 2 ft. $7\frac{1}{2}$ in. is 75%

WHAT YOU HAVE LEARNED

In Books 1 and 2, you have learned :

1. How to add, subtract, multiply and divide :
   - (*a*) Simple numbers;
   - (*b*) Money, weights and measures;
   - (*c*) Vulgar and decimal fractions.
2. How to change the form of a fraction.
   $\frac{1}{2} = 0{\cdot}5 = 50\%$
3. How to find an average.
4. How to write out a bill.
5. How to read and make charts.
6. How to make and use a ready reckoner.
7. How to find and use a formula.
8. How to measure and draw to scale.
9. How to draw angles and triangles.
10. How to find the area of any figure bounded by straight lines.
11. How to find the volume of a box.
12. The following facts about angles :
    - (*a*) Two adjacent (T) angles are together equal to two right-angles (180 degrees);
    - (*b*) Opposite (X) angles are equal;
    - (*c*) Alternate (Z) angles are equal;
    - (*d*) The sum of the angles of any triangle is equal to two right-angles (180 degrees).

$$60{\cdot}3 \div 28 = \frac{60{\cdot}3}{28} = \frac{15{\cdot}07 +}{7} = 2{\cdot}15 +$$

Both the numerator and denominator of the fraction, $\frac{60{\cdot}3}{28}$, have been divided by 4.

The plus sign (+) after the figures 7 and 5 shows that the division can be carried further.

or

$$60{\cdot}3 \div 28 = \frac{60{\cdot}3}{28} = 2{\cdot}15 +$$

$$\begin{array}{r} 2{\cdot}15 \\ 28\overline{)60{\cdot}3} \\ 56 \\ \hline 43 \\ 28 \\ \hline 150 \\ 140 \\ \hline 10 \end{array}$$

$$15\cdot3 \div 0\cdot2 = \frac{15\cdot3}{0\cdot2} = \frac{15\cdot3 \times 10}{0\cdot2 \times 10} = \frac{153}{2} = 76\cdot5$$

To make the divisor a whole number, 0·2 is multiplied by 10. Having multiplied the denominator by 10, we must do the same to the numerator.

Find the value of: 52·3 × 5·7

$$\begin{array}{rl} 52\cdot3 & \times\ 5\cdot7 \\ \underline{5\cdot7} & \\ 261\cdot5 & = 52\cdot3 \times 5 \\ \underline{36\cdot61} & = 52\cdot3 \times 0\cdot7 \\ \underline{\underline{298\cdot11}} & = 52\cdot3 \times 5\cdot7 \end{array} \qquad \text{or} \qquad \begin{array}{r} 52\cdot3 \times 5\cdot7 \\ \underline{5\cdot7} \\ 261\cdot5 \\ \underline{36\cdot61} \\ \underline{\underline{298\cdot11}} \end{array}$$

Find the cost of 5½ lb. when 3¼ lb. cost 6s. 6d.

$$3\tfrac{1}{4}\text{ lb. cost } 6\tfrac{1}{2}\text{s.}$$

$$1\text{ lb. costs } \left(6\tfrac{1}{2} \div 3\tfrac{1}{4}\right)\text{s.}$$

$$5\tfrac{1}{2}\text{ lb. cost } \left(6\tfrac{1}{2} \div 3\tfrac{1}{4} \times 5\tfrac{1}{2}\right)\text{s.}$$

$$= \left(\frac{\overset{1}{\cancel{13}}}{\underset{1}{\cancel{2}}} \times \frac{\overset{\overset{1}{\cancel{2}}}{\cancel{4}}}{\underset{1}{\cancel{13}}} \times \frac{11}{\underset{1}{\cancel{2}}}\right)\text{s.} = 11\text{s.}$$

What weight of coal can I buy for £14, if I pay £6 2s. 6d. for 3½ tons?

$$£6\tfrac{1}{8}\text{ will buy } 3\tfrac{1}{2}\text{ tons}$$

$$£1\text{ will buy } \left(3\tfrac{1}{2} \div 6\tfrac{1}{8}\right)\text{ tons}$$

$$£14\text{ will buy } \left(3\tfrac{1}{2} \div 6\tfrac{1}{8} \times 14\right)\text{ tons}$$

$$= \left(\frac{\overset{1}{\cancel{7}}}{\underset{1}{\cancel{2}}} \times \frac{\overset{4}{\cancel{8}}}{\underset{\underset{1}{\cancel{7}}}{\cancel{49}}} \times \frac{\overset{2}{\cancel{14}}}{1}\right)\text{ tons} = 8\text{ tons.}$$

In the above example, as the answer is to be TONS, the first line is written so that TONS is on the right of the page; that is, we write: £6⅛ will buy 3½ tons, and NOT 3½ tons cost £6⅛.

£	s.	d.	
	13	4	= cost of 1 ton
3	6	8	= cost of 5 tons
	3	4	= cost of 5 cwt.
	1	4	= cost of 2 cwt.
		4	= cost of 2 qr.
3	11	8	= cost of 5 tons 7 cwt. 2 qr.

What fraction of £5 is 12s. 6d.?

$$\frac{\text{12s. 6d.}}{\text{£5}} = \frac{\text{5 half-crowns}}{\text{40 half-crowns}} = \frac{5}{40} = \frac{1}{8}$$

$$\begin{aligned} \frac{13}{15} = \frac{2\cdot6}{3} = 0\cdot8666\ldots &= 0\cdot867 \text{ to the nearest third place of decimals.} \\ &= 0\cdot87 \text{ to the nearest second place of decimals.} \\ &= 0\cdot9 \text{ to the nearest first place of decimals.} \end{aligned}$$

$3\frac{1}{3}\%$ ($3\frac{1}{3}$ per cent. or $3\frac{1}{3}$ per hundred) $= \frac{3\frac{1}{3}}{100} = \frac{10}{300} = \frac{1}{30}$

The numerator and denominator of the fraction $\frac{3\frac{1}{3}}{100}$, have been multiplied by 3.

$$37\tfrac{1}{2}\% = \frac{37\cdot5}{100} = 0\cdot375$$

$$15\% \text{ of } 2{,}450 = \frac{\overset{3}{\cancel{15}}}{\underset{\underset{2}{\cancel{20}}}{\cancel{100}}} \times \overset{245}{\cancel{2450}} = \frac{735}{2} = 367\tfrac{1}{2}$$

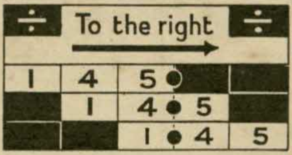
Find the area of a triangle, having a base of 10 ft. and a height of 6 ft.

$$A = \frac{bh}{2}$$

$$A = \frac{10 \times \overset{3}{\cancel{6}}}{\underset{1}{\cancel{2}}} = 30 \text{ sq. ft.}$$

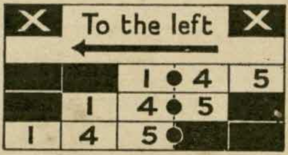
TO DIVIDE BY 10,
move the figures one place to the right.

TO DIVIDE BY 100,
move the figures two places to the right.



TO MULTIPLY BY 10,
move the figures one place to the left.

TO MULTIPLY BY 100,
move the figures two places to the left.

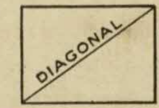


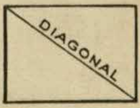
AREA of a RECTANGLE $A = lb$

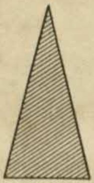
PERIMETER of a RECTANGLE $P = 2\,(l + b)$

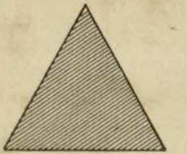
VOLUME of a BOX $V = lbh$

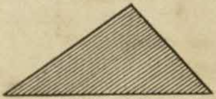
A DIAGONAL is a line drawn across a rectangle from one angle to the opposite angle.
A rectangle has two diagonals.






ISOSCELES


EQUILATERAL


SCALENE

An ISOSCELES triangle has TWO of its sides equal.
(*Isosceles* means *equal legs*.)
An EQUILATERAL triangle has THREE sides of equal length.
An equilateral triangle is also an isosceles triangle.
A SCALENE triangle has three UNEQUAL sides.

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